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Primary Atypical Pneumonia Simulating Infiltrative Pulmonary Tuberculosis

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Primary atypical pneumonia is the term designated by the Surgeon General[1] for a disease syndrome characterized by an influenzal-like onset, relatively normal white count, relatively slow pulse, patchy areas of consolidation and absence of any proven bacterial etiology. This syndrome has been described previously under a variety of names, including interstitial pneumonitis,[2] virus type pneumonia,[3] atypical bronchopneumonia,[4] and acute pneumonitis.[5]

All attempts thus far to isolate the causative organism have been unsuccessful. A Commission for the Investigation of Atypical Pneumonia and Other Respiratory Diseases[6] investigated the problem with negative results. No specific bacterium, fungus or rickettsia was found which could be related etiologically to the disease. They were unable to secure evidence that the virus of influenza or the members of the psittacosis group were causative. Whitely, Bernstein and Goldman[7] examined the serum of eighteen cases of atypical pneumonia for neutralizing antibodies against the Influenza A and B virus. All were found to be negative. Cultures of the sputum have shown the usual throat flora: streptococcus viridans, neisseria catarrhalis, staphylococci, streptococcus hemolyticus, etc. Pneumococci, when found, have been of the "higher types" commonly found in carriers. It has therefore been concluded that the etiologic agent is most likely a virus.

Pathologically, the lesion has been characteristically described as a hemorrhagic interstitial pneumonia, the alveolar walls being infiltrated with monocytes, lymphocytes, plasma cells and occasionally neutrophiles. This is associated with an acute bronchitis.[6,8,9] Campbell and his associates,[10] from their post-mortem observations, feel that the mottled densities noted on x-ray are areas of atelectasis explained on a mechanical basis.

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Clinically, most observers[3,11,12] agree that the onset is usually insidious with the following symptoms quite constantly present: fever, cough, headache, chilliness and substernal distress. The cough, usually dry at the onset, gradually becomes productive of a purulent expectoration. Physical examination, early in the disease, is characterized by the paucity of abnormal signs. The discrepancy between the physical findings and the extent of the lesion roentgenologically has been repeatedly emphasized. Green and Eldridge[13] in a study of eighty cases noted that no abnormal chest findings were found in about one-half their cases on admission. In the remainder, only some decrease in the intensity of the breath sounds and a varying number of fine moist rales were found. Another interesting observation seen in many of our cases is the late development of physical signs in the lungs in those cases which were negative on admission.

In the period between March, 1942, and November, 1943, we have seen in the Station Hospital 61 patients with pulmonary lesions in the upper lung fields roentgenographically resembling infiltrative pulmonary tuberculosis. In addition, 18 cases with similar x-ray findings were seen in the x-ray department having been referred for routine examination by the Flight Surgeon's office. In all of the cases the initial x-ray report suggested the possibility of the lesion being tuberculous in etiology and requested reexamination within one to two weeks. Serial roentgenograms proved all of these to be non-tuberculous and from all clinical and laboratory studies made, we believe them all to be cases of primary atypical pneumonia.

All of the patients were of the white race. Their ages varied between 18 years and 43 years, with seventy-six per cent being between 18 and 27 years of age. Fifty-four of the 79 cases had their lesion in the right upper lobe, 24 in the left upper lobe and one presented a bilateral upper lobe infiltrate.

HOSPITAL PATIENTS—61 CASES

The onset was relatively acute in over half of the patients; eight presented a history of less than 24 hours duration and 38 cases gave a history of two to four days. Thirteen patients had symptoms for five to seven days prior to admission and two patients stated that their symptoms had been present for two weeks. The history presented was usually fairly characteristic and was somewhat as follows: a fairly rapid onset of a dry cough which increased in severity and was accompanied by substernal distress associated with fever, headache and occasionally a sore throat. The cough, later in the course of the illness, was usually associated with the expectoration of a mucopurulent expectoration. As will be noted in Table 1, 25 of the patients complained of a sore throat. Examination of the pharynx in all of these cases showed only a mild injection which one

TABLE 1

SYMPTOM ON ADMISSION IN 61 HOSPITAL PATIENTS

Symptom		
Cough—Productive	34	
—Dry	24	58 Cases
Fever		56 "
Substernal Distress		30 "
Headache		24 "
Sore Throat		25 "
Chilly Sensation		18 "
Generalized Aches		8 "
Blood Streaked Sputum		2 "

would expect with a severe cough. It was the presence of this relatively benign appearance of the throat associated with the fairly characteristic history and fever that made one suspect pulmonary pathology, in spite of the lack of abnormal chest findings on examination. In none of the patients in this series was there noted definite chills, pleuritic pains, dyspnea or cyanosis. None of them appeared acutely ill or toxic.

As in practically all of the cases the x-ray picture resembled a minimal tuberculous infiltrate, it is not surprising that in 37 of them chest physical examinations were repeatedly negative. In the others, diminished breath sounds and rales of the crepitant and subcrepitant variety were the only findings of note and these were present in some of the patients later in the course of the illness, particularly in those whose cough became productive.

Fever was present in all but five of the patients and in 41 of them the temperature ranged between 99° F. and 102° F. on admission. In the remaining 15 cases the temperature was between 102° F. and 104° F. Of the 56 patients who had an elevation of the temperature on admission, a return to a normal level occurred in 87 per cent within 7 days. The longest febrile period was 13 days (one case).

Seventeen of the patients had repeated sputum examinations (smear) for acid-fast bacilli. All were negative. No facilities were available for culture of the sputum for tubercle bacilli, nor were any guinea pig inoculations done. Sputum typings and cultures were done routinely and in no case were any pneumococci found. The organisms reported were those usually found in normal individuals,

namely, neisseria sicca, neisseria catarrhalis, staphylococci and streptococci.

Blood counts were done on 43 patients. In 38, the white blood count was under 12,000 cells with 27 of the cases having a count below 10,000 cells per cubic millimeter. The differential in 42 of the 43 patients showed less than 80 per cent polymorphonuclear leucocytes. Sedimentation rates were done on only 9 patients. Eight of them were increased.

As will be noted in Table 2, the time for complete resolution of the infiltrate was relatively rapid in most of the patients, 77 per cent having cleared within two weeks. The longest period required for complete resolution was 26 days. In comparing the hospital group

TABLE 2

TIME FOR COMPLETE RESOLUTION OF PULMONARY LESION

Time for Resolution	*Hospital—61 Cases*	*Flight Surgeon—18 Cases*
7 to 10 days	38	5
11 to 14 days	9	6
15 to 21 days	13	6
26 days	1	1

with the Flight Surgeon's group of cases who were not hospitalized, it seems apparent that a larger percentage of hospital patients (77%) resolved within two weeks than in the non-hospitalized group (61%). Whether a study of a more nearly equal number of cases would give the same results cannot be stated from this study, but our impression is that hospitalization of these cases would tend to hasten resolution.

All of the cases referred to the x-ray department for roentgen studies of the chest by the Flight Surgeon (a part of the routine physical examination required of candidates for Officer's Candidate School, Aviation Cadet, etc.) were afebrile and asymptomatic and expressed desires to remain on duty. Hence, they were not admitted to the hospital but were requested to return for follow-up x-ray studies.

DISCUSSION

The similarity between the roentgen picture of atypical pneumonia involving the upper lung fields and tuberculosis has been noted by previous observers.[3,8,10,11] In fact Kneeland and Smetana[8] reported a case of atypical pneumonia which was erroneously diag-

nosed as tuberculosis and pneumothorax instituted before the true nature of the condition was established. A similar experience was reported by Goodrich and Bradford.[3] It is our impression based on the study of over a thousand cases of atypical pneumonia that there is nothing characteristic or pathognomonic about the roentgen appearance of that disease which could enable one to differentiate it on a single x-ray film from the ordinary bronchopneumonias or tuberculous infiltrates. The infiltrate is a mottled one, showing varying degrees of coalescence and usually extending out from the hilum towards the periphery. We have had no case which resembled a lobar pneumonia. Nor have we encountered a case with cavitation, although one of our patients (case 1) on the initial x-ray showed a suggestive annular shadow which disappeared on a subsequent x-ray taken seven days later. It has been the experience of all who have studied the disease that by far the majority of the lesions are to be found in the lower lung fields. Of the 250 cases reported by Kasich and Cohen,[11] 34 were found in the upper lobes. Goodrich noted 7 of his 56 cases to be in the upper lobes and in Campbell's series of 200 cases, 23 were similarly located.

It is interesting to note that the majority of our cases were found in the younger age groups, seventy-six per cent being between 18 and 27 years of age. This is in close parallel with the study of a group of 185 patients with minimal tuberculosis studied by Kruger, Potter and Jaffin[15] where it was found that 78 per cent of the exudative lesions were to be found in patients between the ages of ten and twenty-nine years.

It is quite apparent that symptoms are more frequently associated with and are more severe in cases of atypical pneumonia than with cases of minimal tuberculosis. Seventy-seven per cent of our atypical pneumonia patients presented symptoms severe enough to warrant hospitalization without any knowledge of the presence of any pulmonary pathology when first seen by the dispensary officer. The opposite is true in cases of minimal tuberculosis where most of the cases are found in routine mass x-ray surveys or by roentgen examinations of contacts when minimal symptoms are elicited usually only after close questioning.

We are in complete agreement with Blades' and Dugan's[14] statement that "differentiation between atypical pneumonia and pulmonary tuberculosis may be impossible if only one x-ray film of the chest is available, and can only be made after comparison of several roentgenograms and examination of the sputum for tubercle bacilli." In Kruger's series of minimal tuberculous lesions, it was found that the average length of time required for maximum resorption of the infiltrate was six months. This is in marked contrast to the present series of cases of atypical pneumonia where practically all

(ninety-seven per cent) of the lesions showed complete resorption within three weeks.

It was also emphasized in the study on minimal tuberculous lesions[15] that "those who practice immediate collapse therapy on minimal lesions must also occasionally collapse non-tuberculous infiltrates for we do not rarely see patients with what appears to be a "typical" exudative tuberculous infiltrate which will show complete resolution within a period of two or three weeks. The only way by which these non-tuberculous lesions can be differentiated from a tuberculous one (in the absence of a positive sputum) is by serial x-ray study." Decker, Ordway and Medlar[16] emphasize that by the repeated use of cultures and guinea pig inoculations from concentrates of smear-negative sputum or of gastric washings they obtained positive results in 69 per cent of their minimal tuberculous lesions.

The following three cases are typical examples of the cases referred to in this study:

Case 1—Nineteen-year-old white male whose onset of symptoms was one week prior to admission when he developed a productive cough, rhinitis and headache. The day before admission he experienced fever and chilly sensations. Examination revealed a slightly injected pharynx and scattered subcrepitant rales in the right lung between the apex and fourth thoracic spine. White blood count showed 8850 cells with 79 per cent polys. Sedimentation rate was 17 mm. in one hour. Temperature on

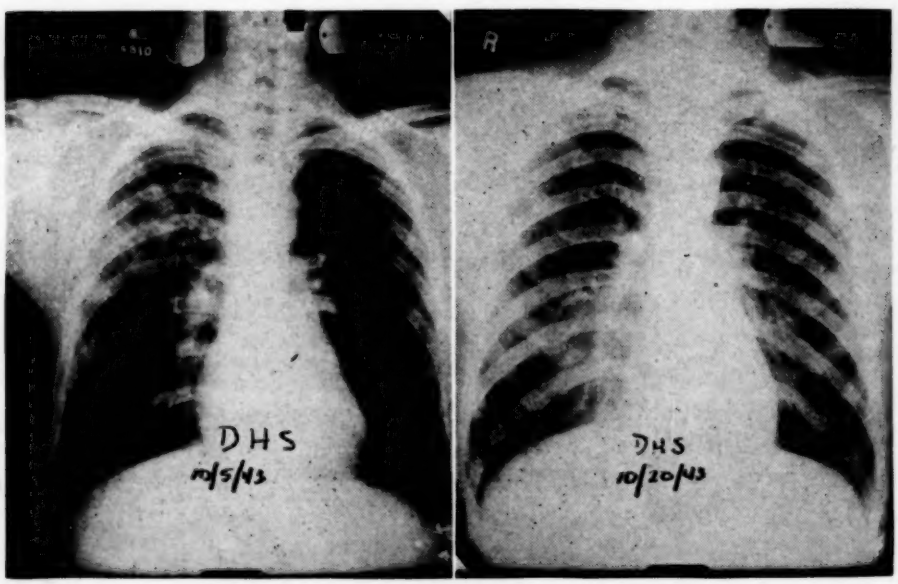

Fig. 1 CASE 1 *Fig. 2*

Fig. 1—Exudative infiltrate right first anterior rib to third anterior interspace. Suggestive annular shadow in second interspace. *Fig. 2*—Fifteen days later—complete resolution of the pneumonia.

admission was 101.2° F. Chest x-ray on admission (Fig. 1) revealed an exudative infiltrate in the right lung between the first anterior rib and third interspace. There was a suggestive annular shadow in the second interspace. On symptomatic therapy, his temperature dropped to normal on the fifth hospital day and a chest x-ray on the fifteenth day (Fig. 2) showed a complete resolution of the pneumonia. A repeat sedimentation rate done the day of complete resolution showed it now to be 3 mm. in one hour.

Case 2—Twenty-six-year-old white male admitted with a history of 24 hours duration—fever, rhinitis, sore throat and headache. Physical examination was negative except for a slightly injected pharynx. His white blood count was 7900 cells with 58 per cent polymorphonuclear leucocytes. The sedimentation rate was 13 mm. in one hour. Temperature on admission was 102.8° F. A chest x-ray taken the day after admission (Fig. 3) revealed an exudative infiltrate in the right upper lobe between the first and third anterior ribs. On symptomatic therapy, his temperature dropped to normal by lysis on the fourth hospital day. A recheck x-ray on the ninth hospital day (Fig. 4) showed a complete resolution of the pneumonia, his sedimentation rate being 6 mm. in one hour on that day.

Case 3—Eighteen-year-old white male admitted with a history of 24 hours duration manifested by fever, headache and a productive cough. His chest examination failed to reveal any abnormal findings. The white blood count showed 12,500 cells with 76 per cent polys. His sedimentation rate was 25 mm. in one hour. His admission temperature was 99.8° F. Chest x-ray (Fig. 5) on the day of admission revealed an exudative infiltrate in the right upper lobe between the apex and second anterior rib. On symptomatic therapy, his temperature returned to normal on the third day of hospitalization. Chest x-ray (Fig. 6) on the eleventh day showed a complete resolution of the pneumonia.

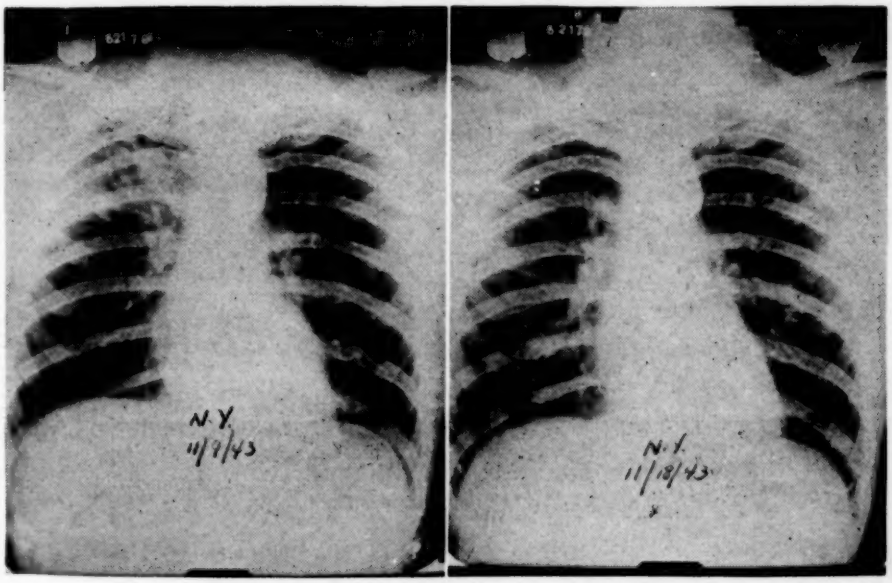

Fig. 3 CASE 2 *Fig. 4*

Fig. 3—Exudative infiltrate right first and third anterior ribs. *Fig. 4*—Nine days later—complete resolution.

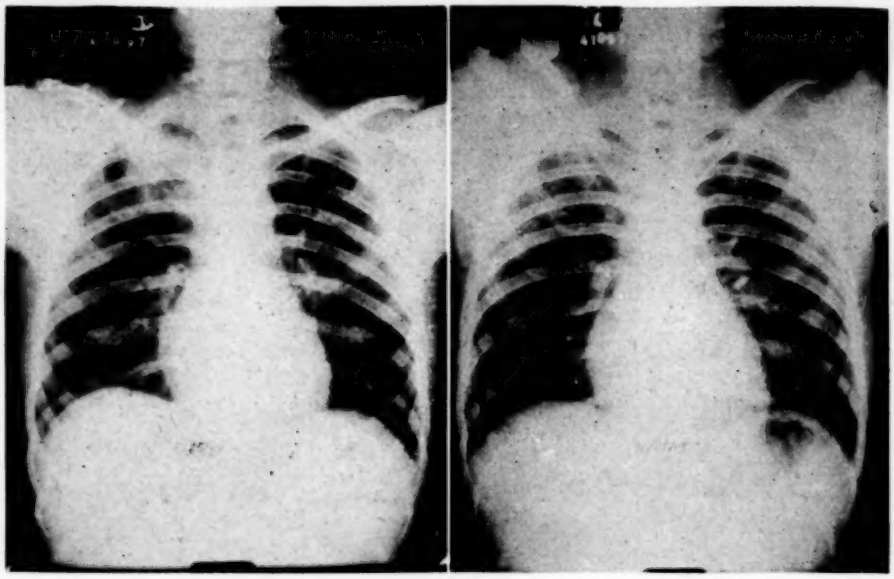

Fig. 5 CASE 3 *Fig. 6*

Fig. 5—Exudative infiltrate right apex to second anterior rib. *Fig. 6*—Eleven days later—complete resolution.

CONCLUSIONS

1) Primary atypical pneumonia not infrequently occurs in the upper lung fields and when it does, presents a roentgen picture not unlike that seen in pulmonary tuberculosis.

2) Complete resolution of the infiltrate in atypical pneumonia occurred in all of our cases in this series within four weeks.

3) A final diagnosis of tuberculosis should not be made in upper lobe infiltrative lesions without serial x-ray studies or the finding of tubercle bacilli in the pulmonary secretions.

CONCLUSIONES

1) La neumonía primaria atípica no es rara en las zonas pulmonares superiores y, cuando se presenta allí, revela un cuadro roentgenográfico semejante al que se nota en la tuberculosis pulmonar.

2) En todos los casos de neumonía atípica en esta serie tuvo lugar resolución completa de la infiltración en menos de cuatro semanas.

3) No debe hacerse el diagnóstico final de tuberculosis en lesiones infiltrantes de los lóbulos superiores hasta que se hagan estudios radiográficos en serie o se descubran bacilos tuberculosos en las secreciones pulmonares.

REFERENCES

1 The Surgeon General: "Primary Atypical Pneumonia, Etiology Unknown," *The Army Military Bulletin*, 61: 31, (April) 1942.

2 Smiley, D. R.; Showacre, E. C.; Lee, W. F., and Ferris, H. W.: "Acute

Interstitial Pneumonitis, a New Disease Entity," *J. A. M. A.*, 112: 1901, 1939.

3 Goodrich, B. E., and Bradford, H. A.: "The Recognition of Virus Type Pneumonia," *Am. J. Med. Sc.*, 204: 163, 1942.

4 Damets, W. B.: "Bronchopneumonia of Unknown Etiology in a Girls School," *Am. J. Med. Sc.*, 203: 263, 1942.

5 Scott, W. G., and Jones, H. L.: "Acute Pneumonitis," *Am. J. Roent.*, 50: 444, 1943.

6 Dingle, J. H.; Abernathy, T. J.; Badger, G. F.; Buddingh, G. H.; Feller, A. E.; Langmuir, A. D.; Ruegsegger, J. M., and Word, W. B.: "Primary Atypical Pneumonia, Etiology Unknown," *War Med.*, 3: 223, 1943.

7 Whitely, J. H.; Bernstein, A., and Goldman, M.: "Primary Atypical Pneumonia: A Report of 25 Cases," *The Military Surgeon*, 91: 499, 1942.

8 Kneeland, Y. Jr., and Smetana, H. F.: "Current Bronchopneumonia of Unusual Character and Undetermined Etiology," *Bull. Johns Hopkins Hosp.*, 67: 229, 1940.

9 Longcope, W. T.: "Bronchopneumonia of Unknown Etiology (Variety X): A Report of 32 Cases with 2 Deaths," *Bull. Johns Hopkins Hosp.*, 67: 268, 1940.

10 Campbell, T. A.; Strong, P. S.; Grier, G. S., and Lutz, R. J.: "Primary Atypical Pneumonia: A Report of Two Hundred Cases at Fort Eustis, Va.," *J. A. M. A.*, 122: 723, (July 10) 1943.

11 Kasich, M., and Cohen, I. S.: "Primary Atypical Pneumonia," *J. Med. Soc. N. J.*, 40: 358, 1943.

12 Finland, M., and Dingle, J. H.: "Primary Atypical Pneumonias of Unknown Etiology," *N. Eng. J. Med.*, 227: 378, 1942.

13 Green, D. M., and Eldridge, F. G.: "Primary Atypical Pneumonia, Etiology Unknown," *The Military Surgeon*, 91: 503, 1942.

14 Blades, B., and Dugan, D. J.: "Pseudo Bronchiectasis Following Atypical Pneumonia," *The Bulletin of the U. S. Army Med. Dept.*, 70: 60, (Nov.) 1943.

15 Kruger, A. L.; Potter, B. P., and Jaffin, A. E.: "Management of the Minimal Tuberculous Lesion," *Am. Rev. of Tuberc.*, 46: 50, 1942.

16 Decker, W. F.; Ordway, W. H., and Medlar, E. M.: "Demonstration of Tubercle Bacilli in Minimal Pulmonary Tuberculosis," *Am. Rev. of Tuberc.*, 47: 625, 1943.

The Mechanism of Hypertrophic Pulmonary Emphysema

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Hypertrophic pulmonary emphysema has in the past shared with certain other diseases, such as arteriosclerosis and Bright's disease, the reputation of being without known cause, yet with a multitude of suggested theories of origin. Nevertheless, a study of the more recent literature will show that two hypotheses stand out as reasonable, both by virtue of clinical observation and experimental evidence. At first it would seem most unreasonable that two entirely different hypotheses could both be correct; but one is reminded of the early days in the search for a cause of rickets, when two schools arose, one that attributed the disease to a fault in the diet, and the other that insisted on the predominant role of lack of sunshine. Eventually the truth showed that both theories were valid. It is the main object of this paper to demonstrate that two reasonable and apparently mutually exclusive theories may both be correct.

It is not the purpose of this paper to go deeply into some of the less probable theories, but a few will be mentioned and commented upon.

1) The occupational theory that blames the playing of wind instruments or the process of glass-blowing has an ancient lineage and has been passed from textbook to textbook with, as Christie[8] has shown, scarcely an iota of proof. Nevertheless, Haldane[12] in a recent popular book (p. 84) seems to carry on the old tradition.

2) The strain of coughing has been blamed and is put forward as a cause in the most recent edition of Price's Textbook[25] and is suggested as a factor in the etiology even by Christie[7] to whom much of the present understanding of the mechanics of the disease is due. Careful consideration will, however, show that, although coughing is a strain both cardiac and muscular, it cannot in any way lead to chronic distension of the pulmonary alveoli. The walls of the alveolus are normally subject to a pressure of approximately 760 mms. of mercury on either surface, and, in the expiratory phase of coughing the pressure may rise another 50 mms. But with the glottis closed the pressure is transmitted to the inside of the alveolus as well, so the result is merely that both sides of the alveolar wall are subjected to a pressure of 810 mm. instead of 760. Naturally, as soon as the glottis opens the pressure in the alveolus falls, but the

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sole effect will be the collapse of the alveolus, and dilatation does not at any point occur. The difficulty of reconciling the expiratory phase of coughing with emphysema led to the suggestion that perhaps the forced inspiration before the cough was the cause. Without doubt this inspiration distends the lungs, but can anyone believe that, in the absence of previous damage to the alveolar wall, it does so to a greater extent than do deep breathing exercises, for instance, which no one would accuse of causing emphysema? No doubt the protrusion of the apices of the lungs during a paroxysm of coughing has led to the belief that they are being overdistended. This is not the case, however; the bulging is due to the fact that the greatly increased intrathoracic pressure cannot squeeze the air out of the lungs, as the glottis is closed, the pressure therefore tends to squeeze out the lungs themselves, through the unsupported top aperture of the thoracic cage. The only connection between coughing and emphysema is that both are associated with chronic disease of the lung.

3) Another explanation that has been put forward, originally by Laennec,[17] is based on the fact that, as the inspiratory muscles are so much stronger than the expiratory ones, in the presence of partial obstruction of the bronchioles more air is inspired than can be expired, hence the alveoli will gradually dilate. Perhaps this is due to a misconception of the mechanics of the lungs, for although the inspiratory muscles are more powerful than the expiratory ones, inspiration is precisely equal to expiration, for inspiration is due to the power of the inspiratory muscles working against the elasticity of the lungs, whereas expiration is due to the expiratory muscles working with the elasticity of the lungs. Supposing, however, it were true that with each breath more air is inspired than is expired, the following simple sum will prove enlightening. Should it happen that 500 cc. of air be inspired and 499.9 cc. expired, 0.1 cc. would remain in the lungs over and above the usual residual air. We breathe approximately 24,000 times a day, so in 24 hours the residual air would be increased by 2,400 cc., and the patient would soon die in a state of full inflation of the lungs, or some compensating mechanism would arise and make the volume of expiration precisely equal to that of inspiration. Perhaps, however, this is the mechanism of the acute vesicular emphysema that is the cause of death in guinea pigs that die from anaphylaxis.

4) Freund[9] and other German authors brought forward the theory that emphysema is secondary to disease of the thoracic cage, i.e., the barrel-chest is the cause of emphysema, not the result. This is hardly possible for acceptance, for whatever ideas an individual might have with regard to emphysema, nearly all are agreed that it is associated with chronic disease of the lung. The mere fact that it is accompanied by a chronic cough should be proof enough.

Furthermore, Cabot[5] believed that the barrel-chest is not necessarily associated with emphysema, and, in a much-quoted piece of research at the Massachusetts General Hospital, out of 12 cases diagnosed during life, only 3 were found at autopsy to have suffered from emphysema, and, out of 153 cases found at autopsy to have suffered from emphysema, only 7 had been diagnosed during life. Kountz and Alexander[16] have revived the postural thoracic deformity in the etiology of senile emphysema, but as this paper is concerned solely with the usual hypertrophic variety this will not be discussed further.

Less well known theories have been put forward and will be mentioned:

5) Brenner[3] quoted Engelhard, Mair and Minzer[21] who suggest that pulmonary arteriosclerosis is primary to the emphysema.

6) Brown-Sequard[4] obtained emphysema by experimental stimulation of the vagi, and

7) Prinzmetal[26] found it could be caused by low atmospheric pressures.

8) Heredity has, of course, been blamed, but it is far more likely that the condition that has led to the emphysema is subject to hereditary influences.

9) The discarded theory of Villemin[30] that there might be a primary defect of the elastic tissue of the lungs.

Finally there remain two theories that have been held over for discussion until the end. One might be called (a) the theory of compensatory distension; the other (b) the theory of obstruction.

Before proceeding to a discussion of these two theories it would be well to mention that when it is stated that the intrathoracic negative pressure is the cause of various phenomena, the true causative pressure is naturally that of the atmosphere, which acts by virtue of the fact that it is slightly greater than the intrathoracic pressure, except in the expiratory stage of coughing. In conformity with general usage, a low negative pressure in the chest means one that is just below atmospheric, and a high negative pressure one that is considerably below that of the atmosphere. The cause of this difference between atmospheric and intrathoracic pressure is the "traction of the chest wall" as described by Christie[7] opposed by the elasticity of the lung.

(A) THE THEORY OF COMPENSATORY DISTENSION

If a considerable proportion of the alveoli of the lung are destroyed by disease, one or both of the following two things must happen:

1) The thoracic cage may contract to reduce the space that would be left where these alveoli were destroyed, or

2) The remaining distensible structures may expand to fill this hypothetical space.

The disease process that produces this loss of alveoli may be either acute or chronic. We are all familiar with the acute form and its results, as shown by, for example, massive collapse of a lobe. In this case, (1) contraction of the thoracic cage occurs by the approximation of the ribs on the affected side and the elevation of the diaphragm, and (2) distension also occurs, for the bronchi in the affected lobe dilate, (such has given rise to the modern theory of bronchiectasis) and alveoli of adjacent lobes are distended. This distension has been called "compensatory" emphysema, and distinguished from hypertrophic pulmonary emphysema. But suppose that the destruction of alveoli has not come about suddenly and "en masse," but gradually, and with the loss of a few alveoli at a time, as would occur in many chronic pulmonary diseases. At no time would the intrathoracic negative pressure rise very high, as it does in massive collapse of a lobe, so the dramatic features of such a pressure, i.e., approximation of ribs and raising of diaphragm, would not occur; but the structures that do respond to the small changes of intrathoracic pressure by deflation and distension, i.e., the remaining alveoli, would become more than usually dilated. Should a third of the alveoli be gradually destroyed, it is obvious that the remaining alveoli will have to enlarge by 50 per cent to make up the same lung volume, and as the process has been gradual, the intrathoracic negative pressure has never risen sufficiently to affect the diaphragm and ribs.

It is, of course, obvious that this picture of compensatorily distended alveoli, which is a familiar process to most of us, is not that of hypertrophic pulmonary emphysema, with its ballooned-out lungs, of much greater volume than the normal, low diaphragm, elongated heart and microscopic picture of destroyed alveolar walls. There has, in fact, been some rather heated discussion as to the possibility of such a sequela. Cabot[5] makes a rather tentative suggestion of its possibility when he states that "In some cases of chronic fibrosing pneumonia and fibrous phthisis, emphysema and possibly barrel-chest may result from distension of the portions of lung uninvolved in the fibroid process, the non-fibrosing parts distending to fill up the spaces left by contraction of the fibrotic portions." The course of events is doubtless as follows:

At first the alveoli are merely distended to fill up the hypothetical space left by destroyed or functionless alveoli. As the alveoli retain their elasticity at first, the lung will remain resilient and contract down when the thorax is opened at autopsy, giving no postmortem evidence of emphysema. This no doubt accounts for the clinical and postmortem discrepancies in the diagnosis of emphysema mentioned

in earlier editions of the book by Cabot,[5] but the source of error has been realized in the latest volume. However, when these alveoli have remained in a state of over-distension for some years they gradually begin to lose their elasticity, as any elastic tissue which is overstretched for considerable periods will do; and also there is the probability mentioned in most textbooks that, as the vessels in the alveolar wall become narrowed in its inflation, the nutrition of the elastic tissue will suffer. Once the lung loses its elasticity, true hypertrophic pulmonary emphysema, as shown by Christie,[6] will inevitably result. So long as the atmospheric pressure is greater than the intrathoracic pressure (i.e., as long as there remains an intrathoracic negative pressure) the lungs will be blown out, the diaphragm depressed, alveolar walls ruptured, and this process will continue until the atmospheric and intrathoracic pressures are equal. An analogy might be made with the aorta. When the elastic tissue in the aorta is destroyed by the spirochaete of syphilis the vessel wall cannot withstand the *normal* blood pressure, and dilates. High blood pressures are not necessary. Similarly the alveolar wall, deprived of its elasticity, cannot withstand that difference by which atmospheric pressure exceeds intrathoracic. To point out that the blood pressure is enormously greater than the intrathoracic negative pressure does not invalidate the analogy, for the aortic wall is likewise enormously thicker than that of the alveolus. This theory of compensatory distension has received an enormous impetus in recent years by the developments of thoracic surgery, and has been removed in a few years from something of mere academic interest to a matter of vital importance to every patient undergoing lobectomy or pneumonectomy, for it is well known that if a lobe or lung is removed, the remaining pulmonary tissue will distend to fill the vacant space. Thoracic surgeons, especially in the United States, have been concerned over the possibility of this compensatory distension giving rise to hypertrophic emphysema, and have conducted various experiments, such as pneumonectomies on dogs, to discover if such a sequela would occur. Adams and Livingstone[1] come to the conclusion that true hypertrophic emphysema does result. Longacre and Johansmann[19] find early hypertrophic changes, whereas Paine,[24] Rienhoff et al.[27] and Loeb[18] deny that true emphysema ever results. Bremer[2] has shown one reason why there should be this confusion, for in puppies the result of the operation is different from that in adult dogs; in the former there is no distension but an active tissue hyperplasia with formation of new alveoli, whereas compensatory distension occurs in the adult. This explains Goldberger's[11] finding that there was no hypertrophic emphysema in a woman with congenital atrophy of one lung. Longacre and Johansmann[19] have further clarified the issue by an insistence on the duration of the

distension before hypertrophic changes can occur. They killed their dogs two, three and four years after the pneumonectomies and found breaking down of alveoli and collapse of capillaries, whereas Paine,[24] Rienhoff et al.[27] and Loeb[18] only allowed their experiments to continue for under a year. Two to four years in the life of a dog would mean an appreciable portion of the lifetime of a man before hypertrophic emphysematous changes would result from compensatorily distended lungs.

In conclusion, there is no doubt in the author's mind that a large measure of truth resides in the theory of compensatory distension. It is also attractive in that it brings emphysema into line with other pathological conditions of the lungs, such as vomica formation and bronchiectasis, which likewise are to a great extent products of the intrathoracic negative pressure.

(B) THE THEORY OF OBSTRUCTION

Behind this theory there is the evidence of generations of accumulated clinical experience that hypertrophic pulmonary emphysema is the end result of disease in which the smaller bronchi and the bronchioles are chronically obstructed. Such conditions are chronic bronchitis and asthma. Exactly why such obstruction should give rise to distension of the alveoli remains a debatable point. The theory discussed earlier in this paper, which deals with the stronger effort of inspiration as compared with expiration, has been brought forward as an explanation in this connection. Christie[7] is inclined to discuss coughing and some undefined "wear and tear" as the adjuncts to obstruction. In MacCallum's Textbook of Pathology (1940) obstruction is brought forward as a cause of emphysema, probably because MacCallum has endeavored to explain as much of human pathology as he possibly can on the basis of obstruction of some of the many tubes that the body possesses.

In this connection we must not be sidetracked by consideration of "obstructive emphysema" which is a different condition, of which many well authenticated cases have been described by Gerlings,[10] Royes,[28] Maxwell,[22] Morlock[23] and others. In this condition a foreign body, a tumor or a flap of mucous membrane lodges in a bronchus in such a manner that a check-valve mechanism occurs, i.e., air can enter through the bronchus but cannot escape through it, hence the portion of lung aerated by that bronchus becomes progressively distended. This check-valve mechanism is much commoner than might be assumed, for, as Chevalier Jackson[14] has shown, the bronchi dilate during inspiration and contract during expiration, hence a foreign body lodged in a bronchus or overriding the spur formed by two bronchi, may not occlude it during inspiration, but will do so during expiration. But the obstruction that

causes hypertrophic pulmonary emphysema does not reside in the trachea or large bronchi and is not of the nature of a foreign body. (To add to the confusion of nomenclature the term "obstructive emphysema" is given by some workers to the condition called here "hypertrophic pulmonary emphysema.")

Experimentalists have been very busy inventing valvular apparati for insertion into tracheae of dogs, some to impede inspiration, others expiration, and yet others both. Hinshaw[13] caused emphysema by expiratory obstruction, and Paine,[24] besides giving an adequate history of the subject, produced emphysema by both inspiratory and expiratory obstruction. All these experiments, however, suffer from a certain artificiality, for a complicated valvular obstruction in the trachea bears little analogy to an old-standing bronchiolar obstruction.

Nevertheless, bronchiolar obstruction can be the cause of emphysema, and the mechanism can readily be explained in the following manner. Except in some rare cases, such as in anaphylaxis in guinea pigs, it is unreasonable to assume that all the bronchioles are constricted and all to the same extent. Some bronchioles will be severely constricted, others less so, and some probably not at all. During inspiration more air will enter the wider tube than the narrower, for the pressure driving the air in is the same in each case, the intrathoracic negative pressure, hence the alveoli communicating with the less obstructed bronchioles will inflate quicker than the others. A stage will arise when these less obstructed alveoli have reached their normal distension, whilst the others are only partially filled, and accordingly the total lung volume has not yet reached the capacity that it should have at the end of a normal inspiration. Any further inspiratory effort will obviously lead to overdistension of the more normal alveoli. Probably the bronchioles that are more obstructed at one time are less so at another, so the majority of the alveoli will be at one time or another overstretched, with eventual loss of elasticity and resultant hypertrophic emphysema. It will, of course, be obvious that this description of events merely makes the obstructive theory a subdivision of the theory of compensatory distension, the only difference being that the alveoli are not destroyed or made airless, but made partially functionless by incomplete obstruction of their bronchioles.

There is one fact that makes this theory of obstruction the only plausible one, and that is that, although obstruction gives rise to emphysema, in the emphysematous lung the bronchi and bronchioles have a tendency to be dilated, and not constricted. Sparks and Woods,[29] for instance, describe varicose dilatations, Peter Kerley[15] similarly describes dilatation and mentions that most cases of localized emphysema are really dry bronchiectasis. Even the pro-

tagonists of pure obstruction have to swallow this rather unpalatable fact. Christie[7] states (p. 511): "the larger bronchioles and bronchi may be dilated in an irregular manner" and Kountz and Alexander[16] state that "the terminal bronchioles and alveolar ducts are characteristically dilated in obstructive* emphysema that is advanced, whereas the bronchi whose diameters vary between 3 mm. and 6 mm. normally show muscle hypertrophy and narrowed lumens. A distinct exception to this has been observed in a few cases associated with long standing bronchitis" (p. 258). On the next page the authors state: "The bronchi are irregularly dilated, especially those whose calibre is about 6 to 8 mms." No such difficulty arises when the theory of obstruction is included in that of compensatory distension, for the same force that distends the alveoli would also dilate the bronchi.

One further point remains to be cleared up, and that is the explanation of why emphysema tends to affect the borders of the lungs more than other sites. Hitherto it has been ascribed to "lack of support" when coughing and so on. A logical answer is, however, available. An alveolus in the center of the lung is surrounded by a large number of other alveoli, each of which communicates with the exterior, and is thus subject to atmospheric pressure. The central alveolus is thus supported on all sides by the pressure of the atmosphere. An alveolus on the border of the lung, however, has other alveoli only on one side of it; the other is adjacent to the pleura, and so more directly subject to the intrapleural negative pressure; hence when its wall loses its elasticity the atmospheric pressure acting from within it tends far more readily to blow it out.

SUMMARY

1) Certain theories of the origin of hypertrophic pulmonary emphysema are discussed and criticized. Some are quite untenable and should disappear from the textbooks.

2) Two theories remain, both having considerable clinical and experimental evidence of their validity. They are: (a) the theory of compensatory distension; (b) the theory of obstruction.

3) It is argued that the theory of obstruction is really merely a subdivision of the theory of compensatory distension.

4) Some of the outstanding features of hypertrophic pulmonary emphysema are explained on this basis.

RESUMEN

1) Se repasan las teorías de causación de enfisema pulmonar hipertrófico. No más que dos de ellas se consideran razonables pero,

*Meaning hypertrophic.

sin embargo, parecen mútuamente exclusivas. Las dos teorías son: (a) la de enfisema compensatorio y (b) la de obstrucción.

2) Se pueden combinar razonablemente, sin embargo, estas dos teorías; la de obstrucción no es más que una división de la del enfisema compensatorio. El mecanismo es, en resumen, lo siguiente: Cuando una proporción de alvéolos se va destruyendo poco a poco por enfermedad, los alvéolos restantes se dilatan para llenar el espacio dejado libre. Como ha sido gradual la destrucción, la presión intratorácica no ha, en ningún momento, subido suficientemente para causar los efectos que se notan en el aplastamiento macizo, tal como el apretamiento de las costillas y la elevación del diafragma. Después de un período de esta dilatación, posiblemente de años, las paredes de los alvéolos dilatados pierden su elasticidad, y el efecto de la presión negativa intratorácica es dilatarlos y destruirlos aún más, presentando de este modo, el aspecto característico de enfisema hipertrófico. Si la lesión original es la obstrucción, como en la bronquitis o en el asma, no puede entrar en los alvéolos obstruídos tanto aire, mientras que en los alvéolos normales entra relativamente más aire, y éstos llegan, de este momento, a dilatarse también.

REFERENCES

1 Adams, W. E., and Livingston, H. M.: "Lobectomy and Pneumonectomy in Dogs," *Arch. Surgery*, 29: 898, 1932.

2 Bremer, J. L.: "The Fate of the Remaining Lung Tissue After Lobectomy or Pneumonectomy," *J. Thor. Surgery*, 6: 336, 1937.

3 Brenner, O.: "Pathology of the Vessels of the Pulmonary Circulation," *Arch. Int. Med.*, 56: 741, 1935.

4 Brown-Sequard, M.: "Indication d'un mode nouveau de production de l'emphyseme pulmonaire," *Compte rendu de la Soc. de Biol.*, 37: 354, 1885.

5 Cabot, R. C., and Adams, F. D.: *Physical Diagnosis*, Bailliere, Tindall and Cox, London, 1938, 12th edit.

6 Christie, R. V.: "The Elastic Properties of the Emphysematous Lung and Their Clinical Significance," *J. Clin. Invest.*, 13: 295, 1934.

7 Christie, R. V.: "Emphysema of the Lungs," *The British Encyclopaedia of Medical Practice*, London, 1937.

8 Christie, R. V.: "Chronic Hypertrophic Emphysema," *Edin. Med. J.*, 46: 463, 1939.

9 Freund, W. A.: "Uber Wechselbeziehungen zwischen Lunge und Thorac beim Emphysem," *Deutsche Med. Wochenschrift*, 27: 1254, 1911. "Uber das Emphysem," Ibid, 39: 603, 1913.

10 Gerlings, P. G.: "Foreign Bodies in the Air-Passages Causing Unilobar Obstructive Emphysema," *Jour. of Laryng. and Otology*, 54: 23, 1939.

11 Goldberger, E.: "So-Called Compensatory Emphysema," *Med. Record*, 149: 193, 1939.

12 Haldane, J. B. S.: *Keeping Cool, and Other Essays*, Chatto and Windus, London, 1940.

13 Hinshaw, H. C.: "Experimental Production of Chronic Obstructive Pulmonary Emphysema in Animals," *Proc. Staff Meetings, Mayo Clinic*, 13: 599, 1938.

14 Jackson, C.: *Bronchoscopy, Oesophagoscopy and Gastroscopy*, W. B. Saunders Company, 1934.

15 Kerley, P.: "Discussion on Emphysema," *Proceedings of Royal Soc. of Med.*, 29: 1307, 1936.

16 Kountz, W. B., and Alexander, H. L.: "Emphysema," *Medicine*, 13: 251, 1934.

17 Laennec, R. T. H.: *Treatise on the Diseases of the Chest and on Mediate Auscultation*, trans. by J. Forbes, New York, 1830, 3rd Edition.

18 Loeb, L. M.: "The Etiology of Emphysema," *Arch. Int. Med.*, 45: 465, 1930.

19 Longacre, J. J., and Johansmann, R.: "An Experimental Study of the Fate of the Remaining Lung Following Total Pneumonectomy," *Jour. Thoracic Surgery*, 10: 131, 1940.

20 MacCallum, W. G.: *Textbook of Pathology*, W. B. Saunders Company, 1940, 7th Edition.

21 Mair, W.: "Atheroma of the Pulmonary Artery," *Jour. Path. and Bacteriology*, 18: 127, 1913.

22 Maxwell, J.: "Localized Emphysema as a Sign of Incomplete Bronchial Obstruction," *Brit. Med. Jour.*, 1: 520, 1940.

23 Morlock, H. V.: "Discussion on Emphysema," *Proc. Roy. Soc. Med.*, 29: 1307, 1936.

24 Paine, J. R.: "Studies in Experimental Production of Pulmonary Emphysema," *Jour. of Thoracic Surgery*, 10: 150, 1940.

25 Price, F. W.: *A Textbook of the Practice of Medicine*, Oxford Univ. Press, 1941, 6th Edition.

26 Prinzmetal, M.: "The Relation of Inspiratory Distension of the Lungs to Emphysema," *Jour. Allergy*, 5: 493, 1933.

27 Rienhoff, W. F.; Reichert, F. L., and Heuer, G. J.: "Compensatory Changes in the Remaining Lung Following Total Pneumonectomy," *Bull. Johns Hopkins Hosp.*, 57: 373, 1935.

28 Royes, K.: "Localized Hypertrophic Emphysema," *Brit. Med. Jour.*, 2: 659, 1938.

29 Sparks, J. V., and Wood, F. G.: "Radiographic Appearances of the Lungs in Chronic Bronchitis and in Emphysema," *Lancet*, 2: 1419, 1932.

30 Villemin, J. A.: "Recherches sur le vésicule pulmonaire et l'emphyseme," *Arch. gén. de méd.*, 118: 385, 1866.

Tuberculosis in Children and Young Adults*

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Current opinion favors the view that the complete evolution of tuberculosis in children is characterized by two stages of development to which the terms "primary phase" and "reinfection or postprimary phase" are being applied. The identification of these two developmental stages of the disease, and the recognition of some special features of each have resulted from the use of several diagnostic procedures.

Bacteriologic examinations of gastric contents, particularly of young infants, have shown that the presence of tubercle bacilli in the body may antedate the development of cutaneous sensitivity to tuberculo-protein. These detailed studies have served, therefore, to reveal the initial or preallergic stage of primary tuberculosis, and also to indicate that it may last from three to eight or more weeks. During this preallergic period migrating tubercle bacilli tend to focalize and produce tubercles which soon attain histologic maturity. The clinical manifestations of this introductory stage of tuberculosis are limited chiefly to the appearance of a transitory fever of moderate degree. Owing, therefore, to the general lack of characteristic symptoms and also to the technical difficulties that attend diagnosis this incubation period of the disease usually escapes detection.

The conclusion of the preallergic interval is marked by the development of sensitivity to tuberculo-protein, a change that can be demonstrated with ease through the use of the sensitive and highly specific tuberculin test. Since this type of sensitivity makes its appearance within a few weeks after tubercle bacilli enter the body the approximate date at which the initial infection occurs in man can be determined with reasonable accuracy provided tuberculin tests are reapplied at short intervals to patients whose initial response to tuberculo-protein was negative. By this procedure the approximate time many children acquired their first infection with tubercle bacilli has been disclosed. This accomplishment has provided a splendid opportunity to study that part of the primary phase of the evolution of tuberculosis which immediately follows the development of allergy. No other diagnostic test affords this privilege.

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Shortly after sensitivity to tuberculin has been acquired x-ray studies begin to contribute important information. In the majority of recently infected children the fresh primary tuberculous lesions are so small or so situated that they escape visualization on chest films. Under these circumstances the positive reaction constitutes the only evidence that the patient has primary tuberculosis. Eventually, however, roentgenographically demonstrable calcium deposits make their appearance in a considerable number of these patients and thus the locations of some of their primary foci of disease become apparent. In some instances the development of pneumonic infiltrations which cast shadows on chest films immediately accompanies the patients' transition from the uninfected to the infected state. Serial x-ray studies show that these infiltrations, which exemplify the primary phase of tuberculosis in its early pneumonic state of development, vary in their location and size. As a rule the shadows they cast on films remain practically unchanged in extent and appearance throughout a period of months and then display a very consistent tendency to resolve slowly. In most instances this reparative process results, in the course of about two years, either in the complete disappearance of the lesion or in its reduction to relatively trivial fibrosed or calcified deposits.

Clinical observations on recently infected children have shown that large as well as small primary tuberculous infiltrations usually have surprisingly little apparent effect on the general health of the child and commonly produce a paucity of physical findings. Obviously, therefore, the detection of the primary phase of the evolution of tuberculosis in the early years of life requires the application of tuberculin tests to children who seem to be well and x-ray examinations of those who react positive to the test. One who defers these two essential diagnostic procedures until suggestive symptoms are present will seldom have an opportunity to study this introductory stage of the disease.

After the initial tuberculous lesions have been reduced to fibrotic or calcified deposits the primary phase of the disease usually enters its protracted latent stage, throughout which the patients manifest no evidence of illness and their primary lesions remain essentially stationary in their roentgenographic appearance. In the majority of the infected children the disease continues in this latent condition throughout the remainder of life. Nevertheless, in some of them tuberculosis eventually progresses beyond its primary phase.

The initial appearance of the second or post-primary phase of the development of tuberculosis in children usually post-dates their primary disease by from one to several years. With advancing age this sequence of events occurs with increasing frequency among infected children particularly after they pass the age of puberty.

In a follow-up study I made at Lymanhurst on 2,555 infected children with an average age of 10.2 years the reinfection or post-primary phase of the disease developed in 83 members of the group during the average period of 6.5 years they were traced. Since these children had many years of life ahead of them when the survey terminated additional members of the group can be expected to develop reinfection tuberculosis in the future. Each time this occurs in the group the sequence of events will be as follows: an antecedent primary tuberculosis followed years later by the reinfection phase of the disease.

The lesions that represent the introductory or incipient stage of the reinfection or post-primary phase of the evolution of tuberculosis usually have the appearance of small pneumonic infiltrations situated particularly in the upper portion of the lung field. A few of these minimal lesions resolve spontaneously in the course of time. More frequently, however, they eventually tend to enlarge, to cavitate, to produce symptoms of increasing severity and to lead to the death of the patient. The common tendency of reinfection lesions to progress contrasts with the equally common inclination of primary tuberculous infiltrations to resolve. In general, therefore, diametrically opposite trends characterize these two phases of the evolution of tuberculosis in children.

As a rule, when reinfection lesions make their initial appearance the antecedent primary lesions have been present for months or years and have been reduced to fibrosed or calcified deposits. In occasional instances, however, and particularly in young infants, the reinfection or post-primary phase of the disease develops while the primary lesions are still in the fresh pneumonic stage of development. When this rapid succession of events occurs some investigators classify the patient's disease as an example of progressive primary tuberculosis, whereas others interpret the situation as exemplifying reinfection tuberculosis superimposed upon or complicating an early stage of the evolution of primary tuberculosis. Fortunately this complicated situation does not occur with sufficient frequency to obscure the fact that the evolution of tuberculosis in children is characterized in most instances by two distinct and well separated phases of development.

If following an initial infection tuberculosis was uniformly fatal and seldom entered a protracted latent stage we would not be discussing primary and reinfection tuberculosis today. Under these circumstances tuberculosis could be classed along with rabies as a disease whose course progresses uninterruptedly to a fatal termination. But since appreciable intervals of latency usually separate the period during which the initial changes take place from that in which the subsequent or reinfection changes occur justification

exists for differentiating the primary from the post-primary phase of the disease. Further justification for making this distinction is provided by the pronounced differences in the course and clinical manifestation displayed by these two stages of the disease.

Currently considerable disagreement exists as to how closely the evolution of tuberculosis in young adults duplicates the fairly stereotyped series of changes known to occur in children. Important information bearing on the point is provided by investigation conducted recently on persons who experienced the initial tuberculous infection during adult life.

Malmros and Hedvoll[2] observed fresh primary infection in 151 adults, and of these patients 104 exhibited no evidence of disease except for the positive reaction to tuberculin they had acquired. In the remaining 47 members of the group definite lesions were demonstrated.

In a follow-up study made by Myers and his collaborators[1] on 564 students of nursing and medicine who became sensitive to tuberculin during their course of study it was observed that 92 per cent of these primary infections failed to produce lesions that could be demonstrated by x-ray examinations. Similar observations are also recorded by Israel and Long[3] who report that "although the change of tuberculin reaction from negative to positive has been observed in many hundreds of adults in our experience, the development of lesions within the ensuing year has been infrequent."

At the Louisiana State University Medical Center in New Orleans 52 of our medical students became sensitive to tuberculin during the past two years and of this group of recently infected adults only one has subsequently developed a lesion which could be demonstrated by x-ray study. Furthermore, none of these students noticed any illness which enabled them to identify the time they acquired their initial infection.[4]

These independent studies indicate that primary tuberculosis in young adults usually proves to be a very mild disease which ordinarily comes under satisfactory control without producing roentgenographically demonstrable lesions. In most instances, therefore, primary tuberculosis in adults is essentially identical to this phase of the disease in children.

Pneumonic infiltration whose appearance accompanied or followed primary infection in adults have been observed particularly by Malmros and Hedvoll,[2] Myers and his collaborators[1] and Israel and Long.[3] Although this group of patients is not large, nevertheless it has provided an opportunity to study lesions in recently infected adults. Some of these infiltrations have been observed to undergo a process of slow resolution which resulted either in the complete disappearance of the lesion or in its reduction to fibrosed

or calcified deposits. These changes duplicate those displayed by primary tuberculous infiltrations seen during childhood. Other members of the group received reapplications of the tuberculin test and repeated x-ray studies at intervals which were not sufficiently short to establish with reasonable accuracy whether their lesions immediately accompanied the primary infection or followed it by an interval of several months. Under these circumstances doubt exists as to whether these foci of disease, whose progress resembled that considered typical of reinfection tuberculosis, represented the primary or the post-primary phase of the disease. In a few instances, however, lesions, whose initial appearance coincided closely with the time the primary infection occurred, steadily increased in size and led to clinically manifest disease. Fortunately these progressive lesions whose interrupted course of development resembles the tendency to expand displayed by the so-called progressive primary tuberculosis seen occasionally in young infants in particular, do not occur with sufficient frequency to conceal the fact that primary tuberculosis acquired by adults usually comes under satisfactory control in much the same manner as occurs commonly in children.

TABLE 1

THE FREQUENCY WITH WHICH SUBJECTIVE SYMPTOMS AND LESIONS DEMONSTRABLE BY X-RAY EXAMINATION FAILED TO ACCOMPANY PRIMARY TUBERCULOUS INFECTION IN ADULTS

Source of Information	*Number With*	
	No Subjective Symptoms	*No Lesions Demonstrable by X-ray*
Myers et al. (40-41)[1]*	.....	92.1%
Malmros and Hedvoll (40)[2]	.....	68.9%
Israel and Long (41)[3]	Majority	Majority
Israel et al. (41)[4]	.....	87.7%
Isager (41)[5]	100%	.....
Leitner (42)[6]	Majority	Majority
Luffler (42)[7]	Majority	Majority
Uehlinger (42)[8]	66.7%	66.7%
Louisiana Med. School (43)[9]	100%	98.1%

*See literature cited.

SUMMARY

On summarizing the situation it is apparent that as a general rule tuberculosis in adults as well as in children is characterized by two dissimilar phases of development whose chronologic sequence is usually interrupted by appreciable but variable periods during which the foci of disease remain latent or dormant. In each age group the primary disease usually proves to be mild and commonly fails to proceed to its second phase of development. Nevertheless, the second or reinfection phase of tuberculosis makes its appearance in each age group with appreciable frequency regardless of whether the antecedent initial infection preceded or followed the age of maturity. When this sequence of events occurs the course of reinfection tuberculosis in adults closely resembles this phase of the disease in children. Preceding and following the age of maturity occasional instances are seen in which the interval separating the primary from the reinfection phase of the evolution of tuberculosis is so short that the complete course of the disease seems to be a single continuous series of progressive changes. In these exceptional cases, and also in the relatively common instances in which appreciable intervals of latency facilitate the differentiation of the primary from the post-primary phase of the disease, the changes which characterize the evolution of tuberculosis in adults are essentially identical to those which occur in children. If fundamental differences characterize the evolution of tuberculosis at different age periods in life, more extensive data than are now available probably will be required to identify these differences with accuracy. For the present I am inclined to conclude that the evolution of tuberculosis in adults is essentially identical to the evolution of the disease in children. This similarity applies to the general as well as to many of the special features of the disease.

RESUMEN

Resumiendo la situación, es evidente que, por regla general, la tuberculosis en los adultos, lo mismo que en los niños, está caracterizada por dos fases distintas de desarrollo cuyo orden cronológico suele ser interrumpido por períodos perceptibles, aunque variables, durante los cuales los focos de la enfermedad permanecen latentes o inactivos. En los dos grupos de estas edades la enfermedad primaria suele ser benigna y, por lo general, no avanza a su segunda fase de desarrollo. Sin embargo, la segunda fase de la tuberculosis, o fase de reinfección, aparece en los dos grupos de estas edades con apreciable frecuencia, no importa si la infección inicial antecedente precedió o sucedió a la edad madura. Cuando esta serie de eventos tiene lugar en el curso de la tuberculosis de reinfección en los adultos, se asemeja intimamente a esta fase de la enfermedad en los

niños. Tanto antes como después de la edad madura se ven casos ocasionales en los cuales el plazo que separa las fases primaria y de reinfección en la evolución de la tuberculosis es tan corto que el curso completo de la enfermedad parece constituir una serie única y contínua de alteraciones progresivas. En estos casos excepcionales, y también en los casos relativamente comunes en los que intervalos perceptibles de estado latente facilitan la diferenciación de las fases primaria y post-primaria de la enfermedad, las alteraciones que caracterizan la evolución de la tuberculosis en los adultos son esencialmente idénticas a las que tienen lugar en los niños. Si existen diferencias fundamentales en la evolución de la tuberculosis en diferentes edades de la vida, probablemente se necesitarán datos más extensos de los que se encuentran por ahora a nuestra disposición para identificar estas diferencias con exactitud. Por el presente me siento inclinado a concluir que la evolución de la tuberculosis en los adultos es esencialmente idéntica a la evolución de la enfermedad en los niños. Esta semejanza es aplicable tanto a los rasgos generales como a muchos de los rasgos especiales de la enfermedad.

REFERENCES

1 Myers, J. A.; Baynton, R. E.; Diehl, H. S.; Streukens, T. L., and Ch'iu, P. T. Y.: "Tuberculosis Among Students and Graduates in Nursing," *Ann. Int. Med.*, 14: 873, 1940.
"Tuberculosis Among Students and Graduates of Medicine," Ibid., 14: 1575, 1941.

2 Malmros, H., and Hedvoll, E.: "Primary Tuberculous Infection in Adults," *Am. Rev. Tuberc.*, 41: 562, 1940.

3 Israel, H. L., and Long, E. R.: "Primary Tuberculosis in Adolescents and Young Adults," *Am. Rev. Tuberc.*, 43: 42, 1941.

4 Israel, H. L.; Hetherington, H. W., and Ord, J. G.: "Study of Tuberculosis Among Students of Nursing," *J. A. M. A.*, 117: 839, 1941.

5 Isager, K.: "Relation Between Primary and Destructive Tuberculosis," *Acta Tuberc. Scand.*, 15: 354, 1941.

6 Leitner, St. J.: "Primary Tuberculosis in Adolescents," *Schweiz. med. Wchnschr.*, 72: 185, 1942.

7 Luffler, W.: "Late Primary Infection and Its Developmental Tendency," *Schweiz. med. Wchnschr.*, 72: 686, 1942.

8 Uehlinger, E.: "Late Primary Infection and Its Early Evolution," *Schweiz. med. Wchnschr.*, 72: 701, 1942.

9 Data from survey made on medical students at the Louisiana State University School of Medicine.

Occurrence of Pulmonary Tuberculosis in Supposedly Screened Selectees*

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Physical standards to exclude tuberculosis from the Army are set up in Mobilization Regulations 1-9, of which three editions and one assemblage of changes have been published since the declaration of a national emergency in August, 1940.

The primary object of the regulations, as respects tuberculosis, is to exclude active or potentially active disease, i.e., essentially, tuberculosis of type or degree that would interfere with individual effectiveness or become a cause of disability. In Mobilization Regulations 1-9, tuberculosis is considered both in its general aspects and as a disease of the chest. In each of the sections concerned is a clear statement that active tuberculosis disqualifies for military service.

The gravity of so-called reinfection type or infiltrative tuberculosis is generally recognized. Little space is needed in regulations to indicate the necessity of excluding tuberculosis of this character. On the other hand, the potentialities of apparently arrested primary tuberculosis are everywhere still debated at length. The unsettled problem of the endogenous origin of progressive tuberculosis of adult life makes necessary a consideration of the stability of the encapsulated and calcified lesions of primary tuberculosis, as well as the infiltrative lesion of the same period.

The first edition of Mobilization Regulations 1-9 issued after declaration of a national emergency left decision as to the potentiality of calcified residues of primary tuberculosis discovered in induction films to the discretion of the examiner. Subsequently, in response to requests from examiners in the field who felt unprepared to accept this responsibility, arbitrary standards, based on the size and number of calcified lesions, were set up. With gathering experience in the interpretation of lesions there was less expression of need by the examiners for arbitrary standards. Limitations as to size and number remained in the regulations as a flag for the exercise of judgment, rather than as a rigid barrier to acceptance.

In current form the regulations exclude any type of tuberculosis believed to be active, and also scarred infiltrative tuberculosis exceeding a total area of 5 sq. cm. in conventional "flat" films. They permit acceptance of men with scarred, apparently arrested lesions

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of less than this extent, provided stability has been confirmed by at least six months' observation. They permit acceptance of small calcified lesions of arrested primary tuberculosis without question and leave to the judgment of qualified medical examiners decision as to acceptance or rejection in the case of large and numerous calcified lesions.

RESULTS IN EXCLUDING TUBERCULOSIS

Figures for rejection of men registered in the Selective Service System are compiled by National Headquarters of the System and the Office of The Surgeon General of the Army. No substantial compilation has as yet been released for publication. In November, 1941, National Headquarters of the Selective Service System published an analysis of reports of physical examinations conducted prior to 31 May 1941.[1] Approximately 2,000,000 men had been examined, of whom 900,000 were found by the combined examinations of local boards and the Army as not qualified for general military service. Two and nine-tenths per cent of these had disqualifying lung defects. The proportion of tuberculosis in the latter was not indicated. Major G. D. Williams[2] of the Office of The Surgeon General published an analysis of induction board experience which indicated that lung defects were responsible for rejection of 1.1 per cent of men examined by the Army boards after the initial screening by the local boards in the period November, 1940, to December, 1941. In the period May to September, 1942, as determined by Williams, the rate of rejection by Army induction stations was 1.63 per cent, ranging from 0.82 in the Fourth to 2.17 per cent in the Third Corps Area. Williams pointed out that during the period of increasing utilization of roentgenography in induction stations, the national rate for rejection for tuberculosis steadily rose.

The individual experiences of a number of induction stations have been published from time to time. Space will not be taken for references to all of these. Ashbury[3] reported the early experience of the Baltimore Induction Station. In 11,870 men examined, consisting of Selective Service registrants and National Guardsmen, 1276 tuberculous lesions were found, of which 1049 were of primary and 227 of reinfection type. Of the total number, 139, or 1.2 per cent of the entire group, were rejected as having lesions not acceptable under Mobilization Regulations 1-9. In the remainder of cases the lesions were considered stabilized. The majority of cases rejected were of minimal, active infiltrative disease, although a number of cases of advanced disease, including several with cavities, were encountered. A subsequent study was made by Ashbury, Whilden and Rogers[4] on 22,054 men examined at the same station from May, 1941, to April, 1942. The results showed close agreement with the first study.

Another study of early induction results was reported by Ehrlich, Schiller and Edwards,[5] who reviewed the records of examination of Selective Service registrants and National Guardsmen in the Southern New York District of the Second Corps Area for the period 25 November 1940 to 31 October 1941. In this interval of nearly a year, 114,130 men had been examined. Eleven hundred fifty-six of these, i.e., 1.01 per cent, were rejected for pulmonary tuberculosis. Approximately one-third were classified as active and the remainder as arrested tuberculosis.

In the majority of reviews reported, the figure for rejection for tuberculosis has been about one per cent. Brown[6] summarized the results of examination of 10,000 men in the induction station at Camp Livingston, Louisiana. Ninety-two, or 0.92 per cent, were rejected for tuberculosis. In this case the figures for active and arrested tuberculosis were the reverse of those reported by the authors just cited, two-thirds being classified as active and one-third as arrested. The rate for Negroes (1.07 per cent) was somewhat higher than that for whites (0.87 per cent). A study confined to Negro inductees has been made by Bowie and Jacobson,[7] who reviewed 102,241 examinations at the induction station, Fort Benning, Georgia. The authors reported 397 rejections for active infiltrative tuberculosis, 338 for calcified primary tuberculosis exceeding the limits specified as acceptable in Mobilization Regulations 1-9, and 126 for scarred infiltrative tuberculosis, apparently arrested but exceeding the 5 sq. cm. specified in Mobilization Regulations 1-9 as the maximum area permitting consideration for acceptance. The total of 861 rejections constituted 0.83 per cent of the men examined. In addition, 1308 men with scars less than 5 sq. cm. in area in flat films were deferred six months for determination of stability, so that the total number of final and temporary rejections was 2.1 per cent. Follow-up was not possible in all of the men deferred for six months, but it was estimated that 60 per cent were ultimately considered acceptable. The final rate of rejection for tuberculosis was calculated as approximately 1.3 per cent.

In all of the studies cited in the foregoing paragraphs, the value of x-ray examination was evident also in the detection of significant nontuberculous disease, including pneumonia of various types, bronchiectasis, abscess of the lung, pneumoconiosis, other forms of pulmonary fibrosis, mycotic disease of the lung, pulmonary emphysema, lung cysts, pulmonary and mediastinal tumors, acute and chronic pleuritis, spontaneous pneumothorax, etc., as well as cardiac abnormalities.

Current unpublished statistics from National Headquarters, Selective Service System, record a total local board and Army tuberculosis rejection rate of a little more than one per cent in Selective

Service registrants. The rate for eighteen and nineteen year old registrants is distinctly lower than that for all ages combined, averaging 0.68 per cent in a sample group, and somewhat higher in Negroes than in whites at these ages (Rowntree, McGill and Edwards[8]).

It is evident that x-ray examination of recruits has been effective in preventing the entrance of a large number of tuberculous men into the Army. The number rejected since the beginning of induction procedures may be estimated as on the order of approximately 1½ per cent. About half of these might be estimated as inactive cases, potentially significant. The others, while including many advanced cases already known or detectable by other means, are made up largely of cases of minimal active tuberculosis that would have escaped attention without x-ray examination.

EFFECTIVENESS OF THE SCREENING PROCESS

The efficiency of the procedure for screening out tuberculosis, in spite of the large number of cases detected, has been far from perfect. Several methods have permitted an estimate of the extent of error. The most direct is rereading films of accepted men, which are filed with the Veterans' Administration in Washington. Long and Stearns[9] reviewed 53,400 of these films, representing induction in the months April to September, 1942, sampling the films from 89 of the 90-95 induction stations in operation at that time. The majority of the films were stereoscopic 4x5 inch single emulsion photoroentgenograms. Five hundred to one thousand were reviewed for each station. Significant tuberculosis was found in the following ratios: 10 per 10,000 for the First Service Command; 13 per 10,000 for the Second, Third, Fourth and Fifth Service Commands; 5 and 7 per 10,000, respectively, for the Sixth and Seventh Service Commands, and 36 and 44, respectively, per 10,000 for the Eighth and Ninth Service Commands. The rate varied within each service command, a few stations having very high rates of error. Calculation on the basis of the number of men concerned indicated that approximately 1500 cases of active tuberculosis per million men were being overlooked at this period.

This disturbing situation appeared to be due to a number of causes. High rates prevailed in stations with relatively unskilled roentgenologists. Most of the lesions missed were minimal infiltrates, many of them partially obscured by bony structures and in the lateral margins of the chest. However, a good many cases of advanced diseases were found, so obvious that it was evident that clerical error had been made. Thus, lack of expert reading and carelessness contributed to the result. However, few stations had made no errors. It was believed that speed, fatigue, monotony and

strain led to occasional error even in stations manned by the most skilled and experienced roentgenologists. Measures to rectify the situation uncovered have been taken, and it is hoped that a review now in course for the corresponding period a year later will disclose significant improvement.

The study by Long and Stearns[9] indicated that approximately 35 men per 10,000 had been accepted with minimal scarred and probably arrested lesions. These were believed in large part to represent acceptance after deferral for study of stability, under the provisions of Mobilization Regulations 1-9. Considering the number of cases excluded for tuberculosis, representing from 1 to 1½ per cent of all men examined, it is noteworthy that such a large number of men remained in whom there were detectable lesions of infiltrative character, presumably tuberculous in origin. Incidentally, the study by Long and Stearns added to the accumulating evidence that a zone of high incidence of pulmonary calcification exists in the east central part of the country. The rate for calcified lesions, interpreted as residuals of healed primary tuberculosis, was found to be more than twice as high as the national average in men examined in induction stations in the adjacent regions north and south of the Ohio River, east of western Missouri and west of Maryland and Virginia. The figures were believed representative of the population, even though obtained from films of accepted men only.

A second means of testing the efficiency of the induction screening is available in the records of Fitzsimons General Hospital, Denver, Colorado. This hospital is the designated general hospital for treatment of tuberculosis in soldiers not transferred to Veterans' Administration facilities or discharged to their own care. The number of tuberculous patients at Fitzsimmons General Hospital increased, following mobilization, reaching a peak in March, 1943, when more than eleven hundred tuberculous patients were under care at one time. An analysis kindly furnished by Col. G. F. Aycock, Chief of the Medical Service, permits some estimate of the efficiency of the various induction stations. During the period 1 January 1943 to 30 June 1943, 360 tuberculous persons were admitted who had entered the Army through the Selective Service System and whose station of induction was recorded in Fitzsimons Hospital records. They had been accepted originally as free from tuberculosis at 81 induction stations, i.e., all but approximately ten of the induction stations in the country. However, two induction stations alone accounted for 8 per cent of all cases and the 10 stations with highest representation for approximately 30 per cent.

It is not to be inferred as established that tuberculosis was present on admission to the Army in all of these cases, which were classified as follows at the time of entrance into Fitzsimons General Hos-

pital: 42 per cent minimal, 37 per cent moderately advanced, and 21 per cent far advanced. A sampling of 100 cases from this and preceding periods made by Capt. W. H. Stearns of the Office of The Surgeon General showed that tuberculous lesions were present or probably present in 66 and not definite in 34 at the time of induction. In 17 of the positive group, the lesion was moderately or far advanced. In a considerable number of cases in which no lesion was apparent in the induction film, the latter was of inferior quality, not adequate for diagnosis.

A final method of determining the effectiveness of the screening procedure is an analysis of the dicharges from the Army on certificate of disability. Such a study is in course.

TUBERCULOSIS CASE FINDING IN THE ARMY

As indicated above, the Army induction station x-ray examinations have constituted an unprecedented tuberculosis case finding survey, which has discovered and brought to the attention of proper authorities a large amount of tuberculosis. The case finding, however, does not stop with the induction station examination. As pointed out above, not a few cases have escaped discovery in the induction stations. Fortunately, routine Army procedure detects the majority of these before great advance has occurred. A review in the Office of The Surgeon General of the Army of the quarterly reports submitted by Fitzsimons General Hospital showed in a sample period that of all the cases of accepted Selective Service registrants who were discovered to have tuberculosis within 24 months after their acceptance, 30 per cent were detected within one month and nearly 80 per cent within six months. It is believed that these figures furnish an index of the care given to the discovery of previously undetected tuberculosis. Symptoms account for the discovery of a few cases, and x-ray examination as part of the general examination in the case of other disease accounts for many more. A significantly high proportion of all cases discovered are found in the course of the required complete physical examination of candidates for commission in the officer candidate schools.

Finally it is to be noted that Army directives (WD Circular No. 146, 22 July 1941, WD Circular No. 3, 5 January 1942) require taking a chest x-ray film of every man discharged. Not a few cases of tuberculosis have been detected in the discharge films taken up to date. It may reasonably be anticipated that with final demobilization, the vast majority of cases of tuberculosis admitted to the Army or developing in the Army after induction, will be discovered.

The effect of such a large case finding campaign should be profound in its influence on the national control of tuberculosis. More

than 10 per cent of the population of the country will have been x-rayed in the physical examinations for military service. Assuming a rejection rate of approximately 1.0 per cent for tuberculosis, the total number of men rejected for this disease will be not far from 150,000. A large proportion of the men diagnosed will undergo treatment. The result should be the arrest of a great number of cases that would otherwise have gone on to advanced disease, and the prevention of further spread as a result of the discovery and isolation of thousands of open cases.

SUMMARY

1) Mobilization Regulations 1-9 contain the physical standards designed to exclude active or potentially active tuberculosis from the armed forces. As currently written these regulations exclude any type of tuberculosis believed to be active, and also scarred, infiltrative tuberculosis exceeding a total area of 5 sq. cm. in conventional "flat" films. They permit acceptance of men with scarred, apparently arrested lesions of less than this extent, provided stability has been confirmed by at least six months' observation. They permit acceptance of small, calcified lesions of arrested primary tuberculosis without question and leave to the judgment of qualified medical examiners decision as to acceptance or rejection in the case of large or numerous calcified lesions.

2) (a) Results in excluding tuberculosis from the Army are indicated in reports from National Headquarters of the Selective Service System and several induction stations based on experience in 1940, 1941, and 1942. In the majority of reviews reported the rate of rejection has been about one per cent after initial screening by the local selective service boards. The rejection rate has been slightly higher for colored registrants (1.3 per cent) than for white. During the period of increasing utilization of roentgenography in induction stations the national rate for rejection for tuberculosis rose. However, recent liberalization of standards as regards calcified lesions has reduced the rejection rate appreciably.

(b) Current unpublished statistics from National Headquarters of the Selective Service System record a total local board and induction board tuberculosis rejection rate of slightly over one per cent in registrants. The rejection rate for 18- and 19-year-old registrants is definitely lower than that of all ages combined, averaging 0.68 per cent in a sampled group.

3) Of the individuals rejected for tuberculosis in the examination of all registrants about one-half might be estimated as inactive cases, potentially significant. The other half, including many advanced cases already known or detectable by other means, are made

up largely of cases of minimal active tuberculosis that would have escaped attention without x-ray examination.

4) The extent of error in the screening process has been studied by: (1) Re-reading 53,400 x-ray films of accepted men, which are filed with the Veterans Administration in Washington. These films were made in the months of April to September, 1942, and were sampled from 89 of 90 to 95 induction stations in operation at the time. The review indicated that during this period approximately 1500 cases of active tuberculosis per million men were being overlooked. Errors were considered due to lack of skill on the part of some roentgenologists, speed, fatigue, monotony, and clerical error. (2) Analysis of 360 case records of tuberculous soldiers admitted to Fitzsimons General Hospital from January 1, 1943, to June 30, 1943. These men had been accepted originally as free from tuberculosis in 81 induction stations. The cases were classified on admission to the hospital as 42 per cent minimal, 37 per cent moderately advanced, and 21 per cent far advanced. It was not estimated that tuberculosis was present on admission to the Army in all of these cases. However, a sampling of 100 cases showed that tuberculous lesions were present in 66 and not definite in 34 at the time of induction. Several films in the latter group were of such inferior quality as to be inadequate for diagnosis. In 17 of the positive group the lesion was moderately or far advanced. (3) Analysis being currently made of discharges from the Army on certificate of disability.

5) Army induction station x-ray examinations have revealed a large amount of tuberculosis and have been of value also in the detection of significant nontuberculous diseases. As noted, some cases of tuberculosis have escaped discovery in the induction stations. Symptoms or subsequent routine Army examinations have resulted in discovery of the majority of these cases before great advance has occurred. A recent survey indicated that approximately 30 per cent were diagnosed within one month and nearly 80 per cent within six months.

6) Routine chest x-ray films are required on every individual at time of discharge from the Army. It may reasonably be anticipated that this procedure will result in discovery of the vast majority of previously undiscovered cases of tuberculosis admitted to the Army or developing after induction.

7) More than 10 per cent of the total population of the country will have been x-rayed in the physical examinations incident to military service. Approximately 150,000 men will have been rejected for tuberculosis. Thousands of these open cases will undergo treatment with resultant arrest of a great number of cases and prevention of further spread of the disease.

RESUMEN

1) Los Reglamentos de la Movilización del 1 al 9 contienen las normas físicas cuyo propósito es la exclusión de tuberculosis activa, o de actividad potencial, de las fuerzas armadas. Estos reglamentos, en su presente forma, excluyen todo tipo de tuberculosis que se juzgue activa y, también, tuberculosis infiltrante cicatrizada que exceda 5 centímetros cuadrados de superficie total en películas aisladas convencionales. Se permite el ingreso de hombres con lesiones cicatrizadas, aparentemente estacionadas, de menor extensión que aquellas, con tal de que se haya confirmado su estabilidad durante seis meses de observación, por lo menos. Se permite, sin restricción, el ingreso de hombres con pequeñas lesiones calcificadas de tuberculosis primaria estacionada, y se deja al juicio de los médicos examinadores habilitados la decisión de aceptar o rechazar los casos con lesiones calcificadas grandes o numerosas.

2) (a) Los resultados del plan para la exclusión de la tuberculosis del Ejército se presentan en informes de la Administración Nacional del Sistema de Servicio Selectivo y de varias juntas de ingreso, basados en la experiencia de 1940, 1941 y 1942. En la mayoría de los exámenes finales presentados en estos informes se rechazó más o menos el uno por ciento de los hombres que habían pasado el examen inicial de las juntas locales del servicio selectivo. El porcentaje de rechazos entre los sujetos de raza negra ha sido algo mayor (1.3 por ciento) que entre los blancos. El coeficiente nacional de rechazos por tuberculosis aumentó en el período durante el cual el empleo de la roentgenografía por las juntas de ingreso iba en vías de aumento. Sin embargo, recientemente la mayor liberalidad de las normas referentes a las lesiones calcificadas ha reducido apreciablemente el coeficiente de rechazos.

(b) Estadísticas corrientes inéditas de la Administración Nacional del Sistema de Servicio Selectivo dan un coeficiente total de rechazos por tuberculosis en juntas locales y juntas de ingreso de un poco más del uno por ciento de los sujetos registrados. El coeficiente de rechazos entre los jóvenes de 18 y 19 años de edad es definitivamente más bajo que el de todas las edades combinadas, promediando 0.68 por ciento en un grupo de muestra.

3) Se puede estimar que la mitad, más o menos, de los sujetos rechazados por tuberculosis en los exámenes de todos los registrados, representa casos inactivos, de significado potencial. La otra mitad, que incluye muchos casos avanzados ya conocidos o que podrían descubrirse por otros medios, está compuesta, en gran parte, de casos de tuberculosis mínima activa que no se habría descubierto sin el examen radiográfico.

4) Se ha estudiado el error cometido en los exámenes de ingreso por los medios siguientes: (1) La re-interpretación de 53,400 pelí-

culas radiográficas de hombres aceptados, archivadas en la Administración de Veteranos en Washington. Se tomaron estas películas en los meses de Abril a Septiembre de 1942 y se incluyeron en la muestra películas tomadas en 89 de las 90 a 95 juntas de ingreso que funcionaban en esa época. La re-interpretación indicó que durante este período se estaban pasando por alto aproximadamente 1,500 casos de tuberculosis activa por cada millón de hombres examinados. Se consideró que los errores se debieron a falta de pericia de parte de algunos roentgenólogos, a prisa, cansancio, monotonía y equivocaciones de empleados. (2) El análisis de 360 protocolos de soldados tuberculosos recibidos en el Fitzsimons General Hospital del 1o. de Enero al 30 de Junio de 1943. Estos hombres habían sido admitidos originalmente como exentos de tuberculosis por 81 juntas de ingreso al Ejército. Los casos fueron clasificados al entrar en el hospital como sigue: 42 por ciento mínimos, 37 por ciento moderadamente avanzados y 21 por ciento muy avanzados. No se juzgó que la tuberculosis existía en todos estos casos al ingresar al Ejército. Sin embargo, una muestra de 100 casos reveló que existían lesiones tuberculosas en 66 y que no se veían lesiones bien definidas en 34, cuando ingresaron al Ejército. Varias de las películas en el segundo grupo eran inadecuadas para el diagnóstico por su calidad defectuosa. En el grupo positivo, 17 tenían una lesión moderadamente o muy avanzada. (3) El análisis que se está realizando actualmente de los soldados dados de baja del Ejército por incapacidad.

5) Los exámenes radiográficos en las juntas de ingreso del Ejército han revelado la existencia de mucha tuberculosis, y también han demostrado su valor en el descubrimiento de enfermedades no tuberculosas significativas. Como se dijo antes, las juntas de ingreso pasaron por alto algunos casos de tuberculosis. Los síntomas, o los exámenes militares rutinarios subsecuentes, han resultado en el descubrimiento de la mayoría de estos casos antes de que se empeoraran mucho. Un censo reciente indicó que aproximadamente el 30 por ciento se diagnosticó en menos de un mes y casi el 80 por ciento en menos de seis meses.

6) Se requieren radiografías torácicas rutinarias de cada sujeto cuando se le da de baja del Ejército. Se puede esperar con razón que este procedimiento resultará en el descubrimiento de la gran mayoría de los casos de tuberculosis, no descubiertos previamente, que ingresaron al Ejército o que contrajeron la enfermedad después del ingreso.

7) Se le tomarán radiografías a más del 10 por ciento de la población total del país con motivo de los exámenes físicos del servicio militar. Se rechazará aproximadamente a 150,000 hombres por tuberculosis. Miles de estos casos abiertos se someterán a tratamiento y, como resultado, un gran número de casos se estacionará, lo que prevendrá la mayor propagación de la enfermedad.

REFERENCES

1 Rowntree, L. G.; McGill, K. H., and Folk, O. H.: "Health of Selective Service Registrants," *J. A. M. A.*, 118: 1223, (April) 1942.

2 Williams, G. D.: "U. S. Army Induction Board Experience, November, 1940, to September, 1942," *Army Medical Bulletin*, No. 65: 105, (Jan.) 1943.

3 Ashbury, H. E.: "Roentgenological Report of Chest Examinations Made of Registrants at United States Army Induction Station No. 6, Third Corps Area, Baltimore, Maryland," *Am. J. Roentg.*, 46: 241, (Aug.) 1941.

4 Ashbury, H. E.; Whildin, J. G., and Rogers, F. T.: "Roentgenological Report of Chest Examinations Made of Registrants at United States Army Induction Station No. 6, Third Corps Area, Baltimore, Maryland, 1 May 1941 to 31 March 1942," *Am. J. Roentg.*, 48: 347, (Sept.) 1942.

5 Ehrlich, D. E.; Schiller, I. A., and Edwards, H. R.: "Army X-ray Examination for Tuberculosis: Army Physical Examination Teams in Southern New York District, Second Corps Area," *Am. Rev. Tuberc.*, 47: 113, (Feb.) 1943.

6 Brown, G. C.: "X-ray and Clinical Findings in the Routine Examination of the Chests of 10,000 Inductees," *Military Surgeon*, 92: 423, (April) 1943.

7 Bowie, E. R., and Jacobson, H. G.: "Routine Chest Radiography on Negro Inductees at Fort Benning, Georgia," to be published.

8 Rowntree, L. G.; McGill, K. H., and Edwards, T. I.: "Causes of Rejection and the Incidence of Defects Among Eighteen and Nineteen Year Old Selective Service Registrants," *J. A. M. A.*, 123: 181, (Sept.) 1943.

9 Long, E. R., and Stearns, W. H.: "Standards of Physical Examination with Respect to Tuberculosis and Their Application as Illustrated by a Review of 53,400 Chest X-ray Films of Men in the Army of the United States," *Radiology*, 41: 144, (Aug.) 1943.

DISCUSSION

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Colonel Freer has outlined for us the progressive changes, based on its cumulative experience, which the Army has made from time to time, during the present emergency, in the physical standards set up to exclude tuberculosis from its forces.

He has given as the primary object of the physical standards for acceptance, the exclusion of tuberculosis of any type or degree that would interfere with individual effectiveness, or become a cause of disability.

We, of the Veterans' Administration, fortified by our experience in the years immediately after the first World War when successive legislative liberalizations of the presumptive provisions of service-connection for tuberculosis for veterans who served in that war were made, believe that if future pension purposes alone were to be served, the ideal delineation of physical standards for acceptance would be that which would have for its purpose the exclusion from the armed forces of every individual who demonstrates evidence of tuberculosis of any type or extent. We realize such a delineation is not practicable. As has been pointed out by Colonel Freer, the potentialities of apparently arrested primary tuberculosis are still

debated at considerable length and if all persons with scarred, apparently arrested, minimal, infiltrative tuberculosis were also unequivocally excluded, the armed forces would be deprived of many individuals whose lesions have been considered stabilized and who will render quite satisfactory service throughout the war period without manifest detriment to their pulmonary condition.

Many observers with a wealth of clinical experience have decried the present physical standards as too arbitrary. Some have stressed the mental anguish and economic stigma which would follow many rejected applicants throughout their lives. There must be a common ground, and the Army in promulgating the current physical standards for acceptance has, after extensive consultative conferences with recognized phthisiologists and roentgenologists, as nearly as possible reflected the prevalent opinion on this much debated question.

That errors were made in the acceptance of men with significant tuberculosis was, of course, inevitable, particularly when it is remembered that the acceptance of selectees was in the hands of over 30,000 examiners of varying ability and thoroughness distributed throughout the entire country.

The Office of the Surgeon General, and Colonel Freer, in particular, are to be commended for the frank approach to this problem and the prompt administrative measures inaugurated to alleviate the situation.

A knowledge of the subsequent ability of the men accepted with minimal, scarred and presumably arrested tuberculous lesions to maintain individual effectiveness in every clime and under adverse war conditions, a close analysis of their Army health record, and an indication of the status of the pulmonary lesions on their final discharge from the Army should prove particularly helpful in future considerations of physical standards for acceptance in the armed forces as well as in subsequent revisions of the Schedule of Disability Ratings promulgated by the Veterans' Administration for the evaluation of disability in tuberculosis and other disablements.

In the twelve-month period ending September 30, 1943, 2275 World War II beneficiaries have been under treatment for active pulmonary tuberculosis in Veterans' Administration hospitals. A majority of these beneficiaries have been admitted directly to our institutions from the Army; a fair number have applied for hospitalization after discharge for tuberculosis from the Navy, and a small percentage are applicants who have been admitted subsequent to their discharge from the armed forces for either disability due to non-tuberculous conditions or by honorable discharge for other reasons.

Admissions of World War II veterans comprised over 20 per cent

of the total tuberculosis admissions of all veterans to all facilities and hospitals (Veterans' Administration, other Government and civil hospitals) for the fiscal year ending June 30, 1943. Approximately 80 per cent of these World War II admissions were first admissions, 13 per cent readmissions and 7 per cent admissions by transfer from other hospitals.

As of September 30, 1943, over 43 per cent of the total World War II tuberculous veterans admitted to hospitals as beneficiaries of the Veterans' Administration were remaining in hospitals under treatment. Less than 7 per cent had been discharged by death, and approximately 31 per cent of those admitted have left the hospitals against the advice or without the permission of the directing physician, before treatment had been completed.

All of us are familiar with the staggering cost of tuberculosis in the last war. The rate for the Army during World War I is given, authoritatively, as nine men per thousand admissions to hospitals. Tuberculosis caused six discharges for disability, per year, per thousand men, in the Army during that mobilization, being the first among all reasons for dismissal from the Army, and accounted for 15 per cent of the disability discharges.

On June 30, 1943, almost twenty-five years after the end of World War I, approximately 52,000 veterans, comprising over 12 per cent of the total living beneficiaries of that war on the compensation and pension rolls, were in receipt of compensation for service-incurred or aggravated tuberculosis, for an average monthly payment of over $2,730,000.

Almost 12 per cent of the total World War II veterans receiving pension as of September 30, 1943, have been allowed disability pension for tuberculosis. This large percentage is accountable, in part, to the fact that individuals in the armed forces suffering with tuberculosis and neuropsychiatric disabilities are being discharged promptly from the Service for continued care by the Veterans' Administration. Because of the many intangible factors involved, the ultimate load of tuberculous beneficiaries in relation to other types of disability can at present only be conjectured, but we can be sure it will loom large.

Tuberculosis as a Navy Problem*

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Though tuberculosis in the U. S. Navy, as in the civilian population, is a definitely diminishing disease, it is still an adversary of no mean strength. The blows which have been directed at this enemy through the past 50 years have sapped his strength considerably and made him "groggy," but the paralyzing, knock-out punch is still to be delivered. It is not entirely certain even yet that we possess the power and the "know-how" to deliver that punch. One thing is sure, however, the day of purely defensive tactics against this particular foe is over, and, as Frost advised several years ago, we are definitely taking the offensive. Mere control of tuberculosis in the U. S. Navy can no longer be considered an acceptable objective. Our goal must be that of utter annihilation of the disease.

This study is a statistically historical presentation of the progress of this battle against tuberculosis in the U. S. Navy. It is an attempt to indicate to the reader the extent to which tuberculosis has been and still continues to be a Navy problem. The writers have limited their discussion to a broad, generalized statistical interpretation of the basic data.[1,2] The elements of statistical significance, though not presented, have been fully considered in all conclusions drawn. The basic data, within the limits of present-day military discretion, are, however, offered in the accompanying tables for the use of any reader so disposed.

ADMISSIONS FOR TUBERCULOSIS**

For the total picture of how the battle against tuberculosis (all forms) has progressed in the U. S. Navy since the beginning of this century, Table I and Figure 1 are presented. The most salient features of these statistics are the following:

1) In the 43-year period there has been a gradual reduction in the rate for Original Admissions to the sick list for tuberculosis (all forms) until the rate for 1942 was only 1/10 that of 1900.

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The opinions or assertions contained herein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the Naval service at large.

Due to the organization of the Medical Corps of the U. S. Navy, the term "Navy" also includes the U. S. Marine Corps.

*Presented before the Southern Chapter, American College of Chest Physicians, Cincinnati, Ohio, November 17, 1943.

TABLE I

ORIGINAL ADMISSION RATES PER 100,000 AVERAGE STRENGTH, TUBERCULOSIS (ALL FORMS), U. S. NAVY AND MARINE CORPS: 1900 - 1942

Year	Average Strength	Number Original Admissions	Original Admission Rate
1900	23,756	131	551.44
1901	26,873	146	543.30
1902	31,240	145	464.15
1903	37,248	250	671.18
1904	40,555	268	660.83
1905	41,313	243	588.19
1906	42,529	206	484.38
1907	46,336	226	487.74
1908	52,913	319	602.87
1909	57,172	311	543.97
1910	58,340	349	598.22
1911	61,399	319	519.55
1912	61,897	264	426.52
1913	65,926	325	492.98
1914	67,141	295	439.37
1915	68,075	253	371.65
1916	69,294	287	414.18
1917	245,580	796	324.13
1918	503,792	2398	475.99
1919	298,774	1409	471.59
1920	140,773	637	452.50
1921	148,861	602	404.40
1922	122,126	393	321.80
1923	116,565	332	284.82
1924	119,280	327	274.15
1925	115,391	285	246.99
1926	113,756	250	219.77
1927	115,316	287	248.88
1928	116,047	254	218.88
1929	117,388	204	175.49
1930	117,453	225	191.57
1931	112,767	191	170.26
1932	110,717	188	169.80
1933	108,183	197	182.10
1934	109,383	178	162.73
1935	114,188	150	131.36
1936	124,408	166	135.84
1937	132,855	152	114.41
1938	139,216	121	86.92
1939	149,618	150	100.26
1940	202,614	191	94.27
1941	348,926	333	95.44
1942*	—	—	53.17

* Provisional.

**There are five means by which a man may be taken up on the sick list:

1) *"Admitted (New Admission)"*—all new admissions for disabilities which have developed or been incurred since entry into the Service and which bear no relation to a disability for which the patient had been previously taken up on the sick list.

Directly related to this downward trend is Figure 1A[3] which offers the percentage decrease in the civilian mortality rate from tuberculosis for white males in the United States, by age, the period 1939-

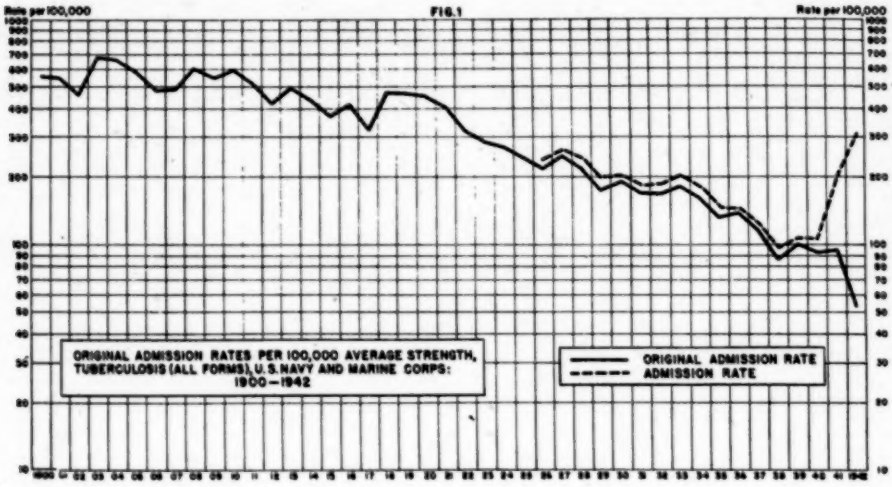
FIG. 1
ORIGINAL ADMISSION RATES PER 100,000 AVERAGE STRENGTH, TUBERCULOSIS (ALL FORMS), U.S. NAVY AND MARINE CORPS: 1900—1942
ORIGINAL ADMISSION RATE
ADMISSION RATE

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2) *"Admitted Contributory Disability" (ACD)*—all first admissions on account of complications or sequelae, including final disability. No case is thus taken up on the sick list unless there has been a previous admission for the disability of which the complication, sequela or dependent disability is a result, or unless the primary disability is present with the complication and has not been previously reported.

3) *"Readmitted (Existed Prior to Entry)" (EPTE)*—all admissions for disability considered to have existed prior to entry into the service and which cannot be charged against Naval service.

4) *"Readmitted"*—all admissions for a disability definitely a continuation or recurrence of one for which the individual had previously been taken up on the sick list.

5) *"Remaining"*—all cases remaining on the sick list on January 1, from the previous year, and carried over into the current year.

For purposes of this paper, all cases of tuberculosis have been categorized into two major divisions, namely, "Original Admissions" and "Admissions." This has been done for purely investigatory reasons.

The classification "Admissions" indicates the actual incidence of "new" cases of tuberculosis in the Navy whether or not they can be charged to Naval service. This, naturally, excludes "Readmitted" and "Remaining," the cases in these categories already having been considered upon original entry to the sick list; it includes "Admitted (New Admission)," "Admitted Contributory Disability," and "Readmitted (Existed Prior to Entry)."

"Original Admissions," on the other hand, most clearly denotes the picture of tuberculosis as it is most directly attributable to Naval service, thus including only "Admitted (New Admission)." No case is included in this classification unless it represents a disability which has never previously appeared while in Naval service, and which, as far as may be ascertained, did not exist prior to entry into the Service. "Admitted Contributory Disability" was excluded from this category because it was found that practically every case of tuberculosis so classed (3.05% of all type admissions for tuberculosis during the years 1926-1942) was one type of tuberculosis reported as a complication of another. The extreme difficulty of charging such complicating disability either to Naval service or "prior to entry" is quite obvious.

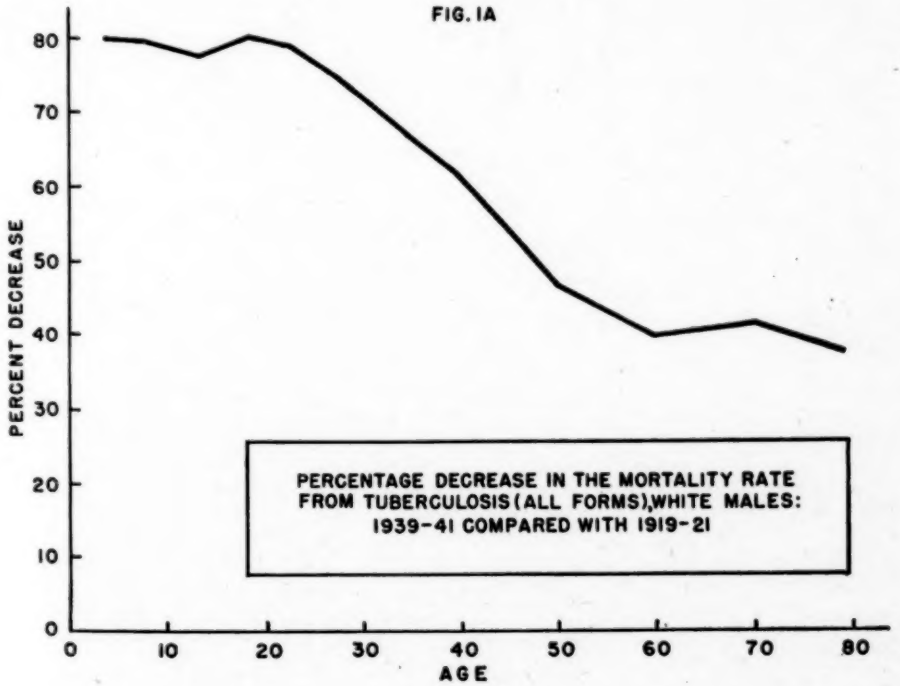
1941 being compared with the period 1919-1921. It is immediately obvious that the greatest reductions have taken place at those ages which comprise the largest proportion of Naval personnel.

2) The first of two major "humps" in this falling curve occurred in the period 1903 through 1905. The most apparent reason for this deviation from the downward trend was the increased interest in tuberculosis case-finding in the Navy which accompanied Comdr. P. M. Rixey's appointment as Surgeon General, and was a part of the general awakening of the medical profession and of the public to the preventability of the spread of tuberculosis.

3) The second of these "humps" took place between the years 1918 and 1922. In explanation, at least two important factors must be given consideration: (a) *World War I*—which made necessary drastic reductions in physical examination standards for entry into the Navy, and by its stresses and strains conduced to tuberculosis; (b) *Pandemic of Influenza*—which not only conduced to tuberculosis, but also led to the unprecedented use of chest radiography which in turn uncovered many new cases of this disease.

4) The curve for Original Admissions in World War II is so different from that for World War I that it is immediately obvious that some change had been effected between the two periods. That change was made in 1926 when the term "Admitted (New Admission)" was redefined to include only new admissions for disability which had developed since entry into the Service and which bear no

FIG. IA



relation to any disability for which the patient had been previously taken up on the sick list. This new definition excluded the above-defined "Readmitted (Existed Prior to Entry)" and "Admitted Contributory Disability." When the Admission rate for tuberculosis (all forms) is plotted for recent years on the basis that existed prior to 1926 (indicated by the broken line in Figure 1), a rise in the rate for World War II comparable to that for World War I is again evident. This time, however, the war-time rise due to lowered physical examination standards for entry into the Navy is supplemented not by a pandemic of influenza, but by the universal application of the photofluorographic technique to the chest examination of all recruits in all Naval Training Stations and other points of indoctrination.* The initiation of this program led to the discovery of many cases of chronic arrested pulmonary tuberculosis which would otherwise have gone unobserved. It resulted in an Admission rate higher than that shown for any other year since 1922, and a more statistically significant rise than that seen in the comparable period for World War I.

To somewhat amplify the over-all picture and to show that this 1942 Admission rate for tuberculosis should not be interpreted as a

*The photofluorographic mass method of examining the chests of recruits was inaugurated at the Norfolk Naval Training Station in January, 1941. Its use rapidly spread through the other Naval Training Stations and other points of indoctrination during 1941, and on January 5, 1942, the general order was issued requiring roentgenographic examination of the chest of all Naval and Marine Corps personnel upon reporting for active duty.

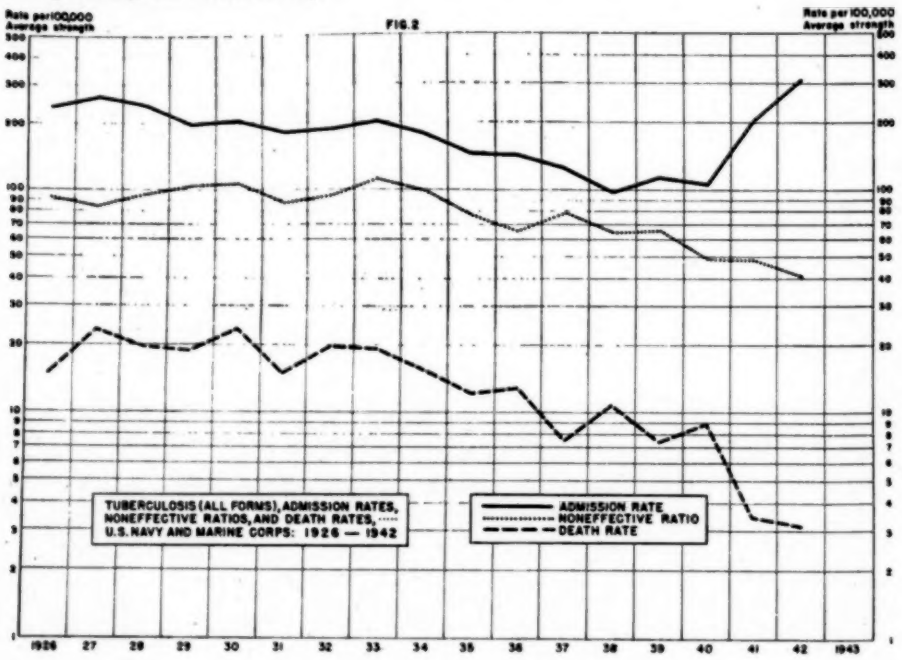


FIG. 2
Rate per 100,000 Average strength
Rate per 100,000 Average strength
TUBERCULOSIS (ALL FORMS), ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U.S. NAVY AND MARINE CORPS: 1926 — 1942
ADMISSION RATE
NONEFFECTIVE RATIO
DEATH RATE
1926 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1943

serious situation getting rapidly out of hand, the writers present Table II and Figure 2 which show that since 1934 the noneffective ratios* and the death rates for tuberculosis (all forms) have quite steadily decreased. This would naturally be expected as the result of the more efficient means of establishing diagnosis early and thus obtaining more prompt separation or discharge from the Service and subsequent transfer to treatment establishments.

Tables III, IV, V, VI, VII and Figures 3, 4, 5, indicate the extent of the problem of tuberculosis in the Navy classified as to type. From these data the following points are clearly deducible:

TABLE II

TUBERCULOSIS (ALL FORMS), ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U. S. NAVY AND MARINE CORPS: 1926-1942

(All rates and ratios are per 100,000 average strength)

Year	*Admission Rate*	*Noneffective Ratio*	*Death Rate*
1926	236.47	82.53	14.97
1927	264.49	83.62	23.41
1928	244.72	94.95	19.82
1929	198.49	103.13	18.74
1930	204.34	106.04	23.84
1931	183.56	87.43	15.08
1932	186.06	93.94	19.87
1933	203.36	111.71	19.41
1934	179.19	99.62	15.54
1935	145.37	77.13	12.26
1936	144.69	75.84	12.86
1937	124.95	78.14	7.53
1938	97.69	65.30	10.77
1939	113.62	65.49	7.35
1940	106.61	49.02	8.88
1941	203.77	48.66	3.44
1942*	310.22	41.20	3.11

*Provisional.

*The noneffective ratio is an indication of the loss of time due to sickness. Thus, the noneffective ratio per 100,000 average strength, as used in this study, represents the average number out of each 100,000 personnel constantly on the sick list for tuberculosis during a given year.

One point of explanation must be noted for the sake of clarity. The noneffective ratios are calculated on the total number of sick days for all types of admissions to the sick list. Inasmuch as in this study "Readmitted" and "Remaining" have been omitted, as explained above, the picture for noneffective ratios is actually an exaggeration of the true representation desired. This is indicated by the formula:

$$\frac{\text{Number of Sick Days During Period}}{\text{Number of Man Days During Period}} \times 100{,}000 = \text{Noneffective Ratio per 100,000}$$

FIG. 3

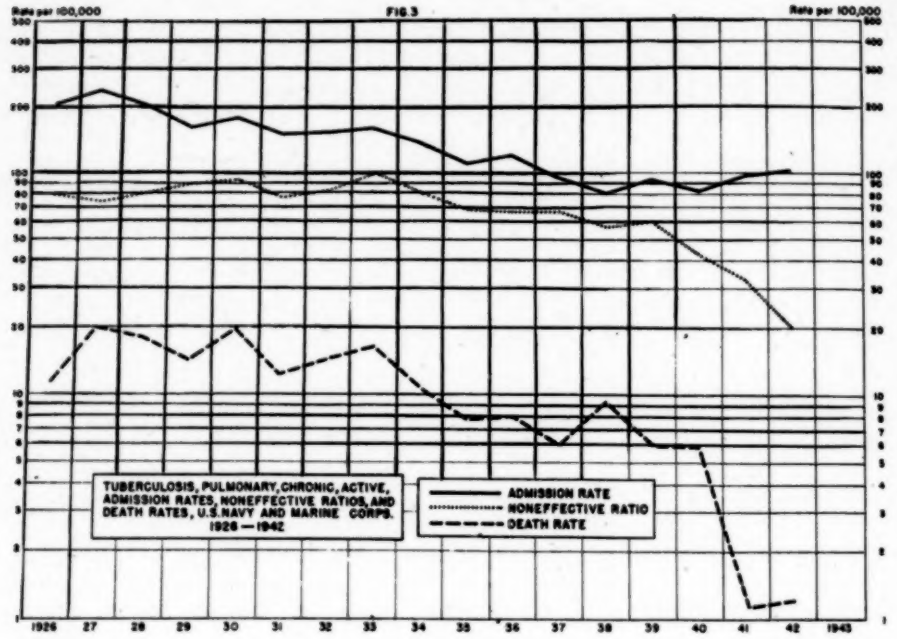
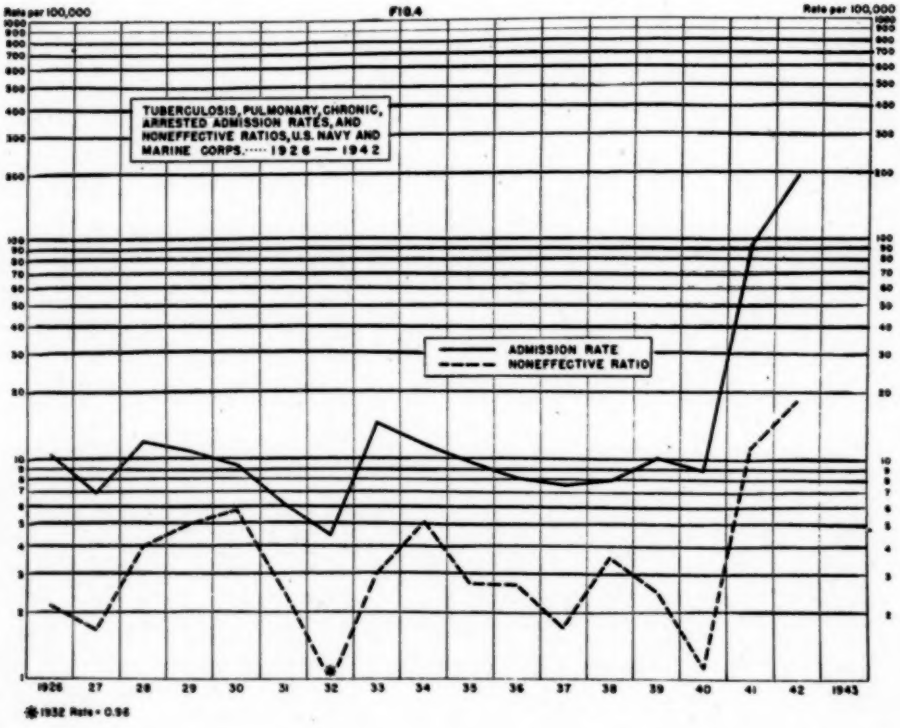

Rate per 100,000
Rate per 100,000
TUBERCULOSIS, PULMONARY, CHRONIC, ACTIVE, ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U.S. NAVY AND MARINE CORPS. 1926 — 1942
ADMISSION RATE
NONEFFECTIVE RATIO
DEATH RATE
1926 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1943

FIG. 4


Rate per 100,000
Rate per 100,000
TUBERCULOSIS, PULMONARY, CHRONIC, ARRESTED ADMISSION RATES, AND NONEFFECTIVE RATIOS, U.S. NAVY AND MARINE CORPS. 1926 — 1942
ADMISSION RATE
NONEFFECTIVE RATIO
1926 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1943
*1932 Rate = 0.96

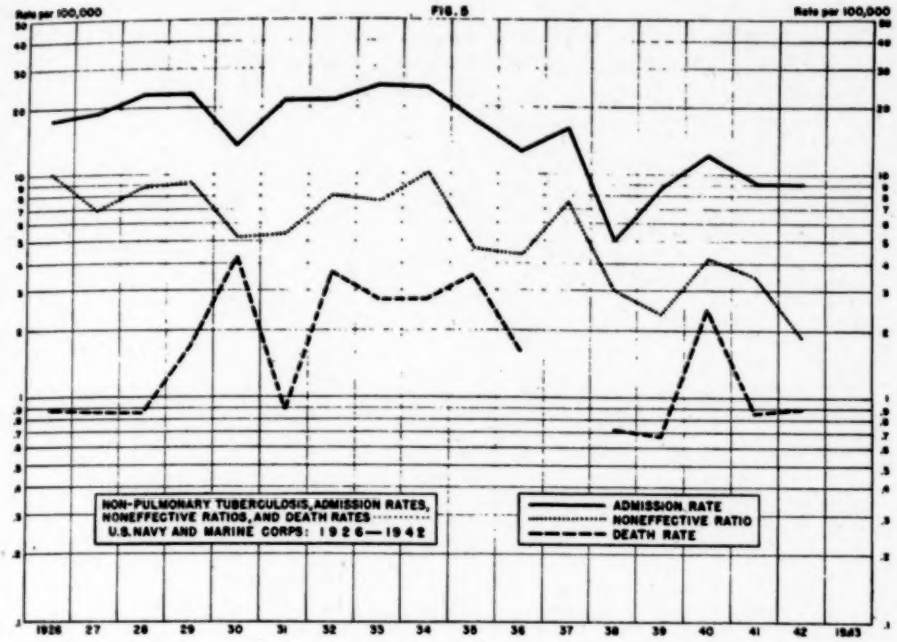


FIG. 5
Rate per 100,000
Rate per 100,000
NON-PULMONARY TUBERCULOSIS, ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES U.S. NAVY AND MARINE CORPS: 1926—1942
ADMISSION RATE
NONEFFECTIVE RATIO
DEATH RATE
1926 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1943

TABLE III

TUBERCULOSIS, PULMONARY, CHRONIC, ACTIVE ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U. S. NAVY AND MARINE CORPS: 1926-1942

(All rates and ratios are per 100,000 average strength)

Year	*Admission Rate*	*Noneffective Ratio*	*Death Rate*
1926	203.95	79.76	11.43
1927	233.27	74.44	19.95
1928	204.23	80.97	18.10
1929	161.00	88.28	14.48
1930	178.79	93.91	19.58
1931	150.75	78.57	12.41
1932	153.54	83.98	14.45
1933	159.91	99.76	16.64
1934	138.05	82.68	10.97
1935	112.10	68.32	7.88
1936	121.37	67.22	8.04
1937	97.10	67.20	6.02
1938	80.45	57.49	9.34
1939	93.57	60.30	6.02
1940	83.90	43.35	5.92
1941	97.44	33.22	1.15
1942*	103.44	20.19	1.22

*Provisional.

TABLE IV

TUBERCULOSIS, PULMONARY, CHRONIC, ARRESTED ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U. S. NAVY AND MARINE CORPS: 1926-1942

(All rates and ratios are per 100,000 average strength)

Year	*Admission Rate*	*Noneffective Ratio*	*Death Rate**
1926	10.55	2.16	. . . .
1927	6.94	1.67	. . . .
1928	12.06	3.99	. . . .
1929	11.07	5.01	. . . .
1930	9.37	5.87	. . . .
1931	6.21	2.58	. . . .
1932	4.52	0.96	. . . .
1933	14.79	3.02	. . . .
1934	11.88	5.10	. . . .
1935	9.63	2.70	. . . .
1936	8.04	2.67	. . . .
1937	7.53	1.71	. . . .
1938	7.90	3.57	. . . .
1939	10.03	2.50	. . . .
1940	8.88	1.14	. . . .
1941	92.28	11.24	. . . .
1942**	193.57	18.27	. . . .

*There were no deaths from this disease during this period.
**Provisional.

TABLE V

TUBERCULOSIS, PULMONARY, ACUTE, GENERAL MILIARY, ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U. S. NAVY AND MARINE CORPS: 1926-1942

(All rates and ratios are per 100,000 average strength)

Year	*Admission Rate*	*Noneffective Ratio*	*Death Rate*
1926	0.88	0.00	0.00
1927	1.73	0.08	1.73
1928	1.72	0.24	0.86
1929	3.41	0.25	2.56
1930	0.85	0.19	0.00
1931	0.89	0.21	0.89
1932	1.81	0.16	0.90
1933	0.00	0.00	0.00
1934	0.91	0.11	0.91
1935	1.75	0.24	0.88
1936	1.61	0.30	2.41
1937	1.51	0.39	0.75
1938	1.44	0.15	0.00
1939	0.67	0.03	0.67
1940	0.49	0.12	0.49
1941	2.01	0.34	1.15
1942*	0.89	0.14	0.89

*Provisional.

TABLE VI

TUBERCULOSIS, PULMONARY, ACUTE, PNEUMONIC, ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U. S. NAVY AND MARINE CORPS, 1926-1942

(All rates and ratios are per 100,000 average strength)

Year	*Admission Rate*	*Noneffective Ratio*	*Death Rate*
1926	4.40	0.49	1.76
1927	3.47	0.48	0.87
1928	4.31	0.93	0.00
1929	0.00	0.31	0.00
1930	1.70	0.80	0.00
1931	4.43	0.62	0.89
1932	4.52	0.78	0.90
1933	4.62	1.25	0.00
1934	3.66	1.53	0.91
1935	4.38	1.20	0.00
1936	3.22	1.23	0.80
1937	3.01	1.38	0.75
1938	2.87	1.06	0.72
1939	0.67	0.29	0.00
1940	0.99	0.25	0.00
1941	2.87	0.43	0.29
1942*	3.22	0.70	0.11

*Provisional.

TABLE VII

NON-PULMONARY TUBERCULOSIS, ADMISSION RATES, NONEFFECTIVE RATIOS, AND DEATH RATES, U. S. NAVY AND MARINE CORPS: 1926-1942

(All rates and ratios are per 100,000 average strength)

Year	*Admission Rate*	*Noneffective Ratio*	*Death Rate*
1926	17.58	10.12	0.88
1927	19.08	6.94	0.87
1928	22.40	8.83	0.86
1929	23.00	9.28	1.70
1930	13.62	5.28	4.26
1931	21.28	5.44	0.89
1932	21.68	8.05	3.61
1933	24.96	7.68	2.77
1934	24.68	10.18	2.74
1935	17.51	4.67	3.50
1936	12.86	4.42	1.61
1937	15.81	7.47	0.00
1938	5.03	3.03	0.72
1939	8.69	2.37	0.67
1940	12.34	4.16	2.47
1941	9.17	3.44	0.86
1942*	9.10	1.88	0.89

*Provisional.

1) The Admission rates for chronic, active pulmonary tuberculosis show a steady downward trend with only a slight rise perceptible for the present war (see Fig. 3 and Table III). Because of the readier recognition of this active form of tuberculosis upon the basis of manifest signs and symptoms irrespective of x-ray study, the advent of mass x-raying has not resulted in the great increase in these cases as is recorded for chronic, arrested, pulmonary tuberculosis (see below).

2) The admission rate for chronic, arrested, pulmonary tuberculosis in 1941 (see Fig. 4 and Table IV) was almost 10½ times greater than the rate in 1940. The rate again doubled in 1942. It quite logically follows that this type of tuberculosis is responsible for the 1941-1942 rise in tuberculosis (all forms). The explanation lies not in an intrinsic increase in this disease, but in the greatly expanded utilization of roentgenographic examinations of Naval personnel.

The noneffective ratio rose in 1941 and 1942 as a reflection of the length of hospitalization often necessary for clinical study of such cases preliminary to proper disposal. There were, of course, no deaths from the arrested form of this disease.

3) The curve for non-pulmonary tuberculosis (see Fig. 5 and Table VII) demonstrates much variation, but a general downward trend is apparent, as might be expected from the same trend noted in the chronic, active, pulmonary tuberculosis.

4) The Admission rates for acute, general miliary, pulmonary tuberculosis (see Table V) and for acute, pneumonic, pulmonary tuberculosis (see Table VI) do not show significant traits.

TUBERCULOSIS INCURRED IN SERVICE

Having examined the incidence of tuberculosis in the Navy in its broadest terms, the writers were next interested in determining the extent to which Naval service itself contributes to the development of tuberculosis among its personnel. It will be observed that this discussion is limited to a study of Forces Afloat as compared with Forces Ashore, and an examination of this disease according to Occupational Distribution.*

Comparison of Original Admission rates for tuberculosis (all forms) among Forces Afloat with Forces Ashore shows no significant difference between the two (see Table VIII). Apparently life at sea in spite of the sometimes crowded sleeping quarters, continued exposure to inclement weather, broken sleep, and oft-times arduous duties, does not conduce to the development of tuberculosis any more than does life in a shore station.

Occupational groups, on the other hand, do manifest differences

*A thorough exploration of this subject obviously lies beyond the scope of this paper.

(see Fig. 6 and Table IX). It was found that three groups, culinary, hospital corps, and engine room stood alone in showing Original Admission rates almost consistently above the mean rate for all occupations year after year. It is of interest to note that all three of these groups are forced to lead, more than are certain other groups, an indoor type of life. In addition to this factor, the hospital corps, in many cases, is more openly exposed to tuberculous patients.

It will also be observed from Table IX that the groups Nurses and Prisoners showed high specific rates in certain years, but these two groups represent comparatively small populations so that even a small frequency of tuberculous cases would result in an abnormally high rate for the year. The occasional high rates in these groups are not therefore considered important.

Another possible indication as to the amount of tuberculosis incurred in Naval service is the report of the photofluorographic survey made of the chests of 713 enlisted men aboard a Navy cruiser late in 1942. This ship was in the Philadelphia Navy Yard at the time the Philadelphia Tuberculosis Association was conducting a chest x-ray study of the civilian personnel of the yard.

Of the 713 films made, 8 were illegible because of double exposure or other error. Of the remaining 705, there were 13 (1.84%) which were deemed to possess findings of clinical significance. However, only 3 were affected with pulmonary tuberculosis and subsequently

TABLE VIII

ORIGINAL ADMISSION RATES PER 100,000 AVERAGE STRENGTH, TUBERCULOSIS, FORCES AFLOAT AND FORCES ASHORE, U. S. NAVY AND MARINE CORPS: 1933 - 1941

DISEASE	Activity	1933	1934	1935	1936	1937	1938	1939	1940	1941
Tuberculosis (all forms)	Forces Afloat	193.99	165.71	129.83	122.91	122.06	93.06	108.31	109.43	116.89
	Forces Ashore	160.18	157.29	134.95	159.57	99.96	74.77	85.82	75.02	78.58
Tuberculosis, Pulmonary, Chronic Active	Forces Afloat	166.89	130.30	101.12	106.77	95.57	83.32	94.77	90.90	96.60
	Forces Ashore	131.30	139.24	117.34	132.22	86.92	66.23	83.95	62.70	55.47
Tuberculosis, Pulmonary, Acute General, Miliary	Forces Afloat	0.00	1.42	1.25	0.00	1.15	0.00	1.04	0.88	2.59
	Forces Ashore	0.00	0.00	2.93	4.56	2.17	0.00	0.00	0.00	1.54
Tuberculosis, Pulmonary, Acute Pneumonic	Forces Afloat	4.28	2.83	4.99	2.48	3.45	2.16	1.04	0.00	1.30
	Forces Ashore	5.25	5.16	2.93	4.56	2.17	4.27	0.00	2.24	3.60
Tuberculosis, Pulmonary, Chronic Arrested	Forces Afloat	2.85	7.08	6.24	1.24	4.61	4.33	1.04	6.18	6.48
	Forces Ashore	13.13	2.58	2.93	9.12	2.17	2.14	0.00	3.36	14.38
Non-Pulmonary Tuberculosis	Forces Afloat	19.97	24.07	16.23	12.42	17.27	3.25	10.41	11.47	9.72
	Forces Ashore	10.50	10.31	8.80	9.12	6.52	2.14	1.87	6.72	3.60

TABLE IX

ORIGINAL ADMISSION RATES PER 1000 AVERAGE STRENGTH FOR TUBERCULOSIS (ALL FORMS), ACCORDING TO OCCUPATION, U. S. NAVY AND MARINE CORPS: 1918 - 1941

	OCCUPATION	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
	Total All Occupations	4.76	4.72	4.53	4.04	3.22	2.65	2.74	2.47	2.20	2.49	2.19	1.75	1.92	1.70	1.70	1.82	1.63	1.31	1.36	1.14	0.87	1.00	0.94	0.95
Officers	Navy*	4.32	4.73	2.33	3.48	2.06	1.58	1.41	2.55	1.25	1.81	1.29	1.68	1.11	1.20	1.47	0.63	0.94	0.81	1.26	0.85	0.45	0.60	0.53	0.45
	Marine												0.84	1.61	0.00	0.00	0.83	0.84	0.00	1.50	0.71	1.38	0.65	0.52	1.12
	Midshipmen	0.00	2.49	2.48	2.22	2.21	1.30	1.43	3.94	0.00	0.81	1.23	0.00	0.51	1.02	0.56	0.00	0.63	1.14	0.00	0.47	0.00	0.00	0.86	0.26
Artificers	Electricians	7.12	4.91	4.52	2.85	2.69	2.01	3.31	1.62	2.69	2.86	3.65	2.53	2.73	1.59	2.43	2.63	1.81	0.91	2.01	1.87	2.15	1.56	1.69	2.04
	Engine Room	7.10	6.38	4.70	4.11	3.39	4.00	3.88	2.55	2.93	2.29	3.09	3.00	2.87	2.38	2.48	2.68	2.39	1.95	1.45	1.85	1.06	2.52	1.28	1.26
	Fireroom	3.57	5.16	4.26	4.20	2.78	3.56	3.82	2.37	3.36	3.62	1.99	1.88	1.74	1.70	0.88	1.58	1.40	1.60	1.23	1.37	0.97	1.29	1.03	1.05
	All Others	6.10	2.31	3.43	4.18	3.08	2.97	2.10	3.90	2.04	2.03	2.84	2.89	2.07	2.11	1.96	3.67	1.67	1.29	1.53	1.15	1.06	1.00	0.21	1.31
Miscellaneous Force	Clerical	11.06	3.61	4.18	8.28	3.06	5.21	3.90	2.85	2.00	2.40	3.76	2.53	1.94	2.33	2.35	3.62	2.73	1.19	2.66	1.51	1.19	2.01	2.65	1.63
	Culinary	6.39	8.36	4.97	4.58	4.38	4.26	4.92	4.98	2.36	3.52	3.42	3.33	2.84	3.18	2.83	2.93	3.15	3.98	2.14	1.33	1.80	1.65	1.95	2.55
	Hospital	9.01	11.91	15.14	7.76	8.50	8.02	7.43	6.18	3.91	8.22	3.81	3.50	5.06	2.47	2.39	3.04	3.09	0.60	2.69	2.29	0.24	1.60	1.30	2.23
	Marines	3.52	5.54	5.68	3.05	2.91	1.96	1.57	2.03	2.11	2.38	1.72	1.08	1.75	1.81	1.57	1.33	1.77	1.08	1.32	1.19	0.82	0.65	0.66	0.71
	Marine Musicians												0.00	0.00	0.00	0.00	8.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78
	Navy Musicians	2.10	2.08	1.42	5.11	2.19	0.56	1.43	3.58	1.07	2.92	2.34	1.50	0.73	4.47	2.29	2.43	4.35	3.42	2.63	4.24	0.83	0.78	2.20	0.00
	Prisoners	15.96	14.52	8.54	4.90	5.25	1.61	7.56	0.00	0.00	3.66	3.12	1.10	2.37	2.54	3.51	0.00	0.00	9.13	0.00	5.56	0.00	0.00	0.00	3.82
	Nurses (Female)			14.15	10.71	12.30	2.01	0.00	4.13	0.00	4.13	8.21	0.00	1.99	9.56	3.97	13.19	2.82	5.95	5.46	2.51	2.35	2.28	2.17	1.50
	Aviation					2.85	1.19	3.17	3.05	2.37	1.36	1.66	1.48	2.41	0.64	1.53	1.54	0.61	0.31	1.07	0.86	0.93	0.87	0.72	1.47
Seaman Branch	Apprentices	6.84	6.82	5.89	4.35	3.03	1.92	0.90	0.71	1.16	1.46	0.96	0.00	0.00	0.42	0.00	0.00	0.41	0.45	0.00	0.37	0.00	0.15	0.16	0.34
	Ordnance	1.49	3.90	3.79	2.91	3.17	3.51	2.91	2.55	2.00	1.74	2.07	2.86	1.90	2.27	1.78	1.22	1.79	1.95	2.03	0.96	1.34	1.66	0.34	1.98
	All Others	4.35	3.01	3.30	3.66	3.04	2.60	2.21	1.80	2.12	1.91	1.90	1.33	1.70	1.09	1.52	1.63	1.41	1.04	1.05	0.75	0.58	0.60	1.02	0.70

*Navy and Marine officers were reported as a single group until 1929

discharged from the service on this basis. The diagnoses were (1) tuberculosis, pulmonary, chronic, active, moderately advanced; (2) tuberculosis, pulmonary, chronic, active, far advanced; (3) tuberculosis, pulmonary, chronic, arrested, moderately advanced.

Thus, it can be concluded that as many as 0.43 per cent of a crew of 705 enlisted men on board this type of vessel may be found upon roentgenographic examination and follow-up study to possess clinical tuberculosis of sufficient severity to necessitate separation from the Service. It must be remembered, though, that this study is one of only 705 men from a single vessel. Chance variation in the number of tuberculosis cases found, either plus or minus one, could have caused the percentage to be 0.28 or 0.56 per cent. Caution, therefore, must be exerted in making any generalizations from this particular study. It does, however, give both point and urgency to the effort to obtain periodic roentgenographic examination of all Naval personnel on active duty.

INVALIDINGS FROM THE SERVICE*

Another very important component of the problem of tuberculosis in the U. S. Navy is the procedure of discharging a man from the Service because of the existence of this disease. When cognizance is taken of the intricate process involved in so discharging a man,

*"Invaliding from the Service" is the act of discharging or separating a man from the Service due to disease or physical disability.

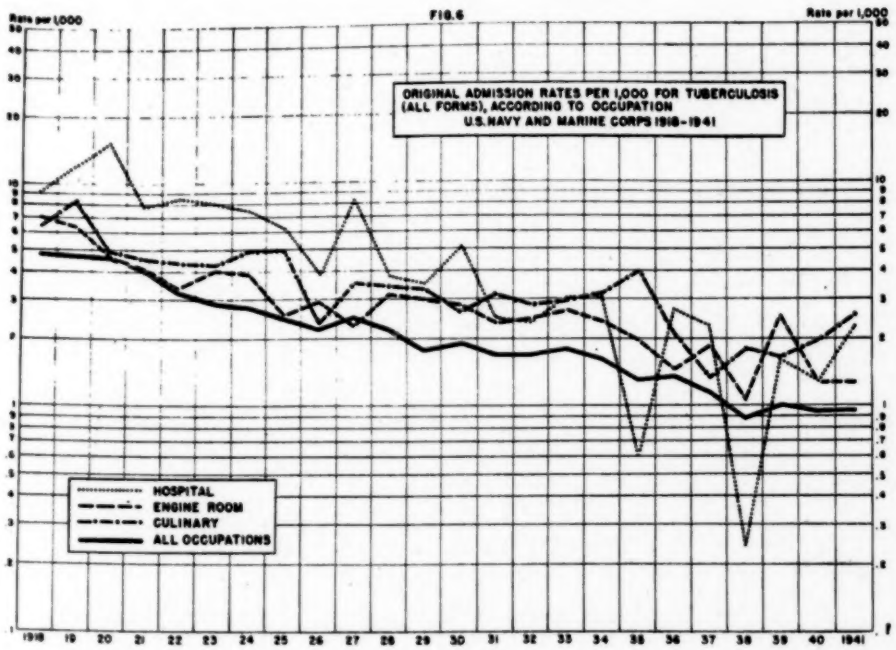


FIG. 6
Rate per 1,000
Rate per 1,000
ORIGINAL ADMISSION RATES PER 1,000 FOR TUBERCULOSIS (ALL FORMS), ACCORDING TO OCCUPATION U.S. NAVY AND MARINE CORPS 1918-1941
HOSPITAL
ENGINE ROOM
CULINARY
ALL OCCUPATIONS
1918 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 1941

the cost in time, effort, personnel, financial expenditure, hospital space, etc., the full significance of keeping the frequency of such discharges at a minimum is easily appreciated. It is particularly important as related to tuberculosis, because of the fact that many of the men are discharged from the Navy only to be kept under Government surveillance by means of the Veterans' Administration in order that treatment may be continued. The statistical picture of this procedure (Fig. 7 and Tables X and XI) can be fully understood only when the following important facts are taken into consideration:

1) Before January, 1941, chest roentgenography had been limited to those cases which manifestly possessed clinical symptoms of tuberculosis; mass roentgenographic studies had not yet been undertaken.

2) Between January, 1941, and February, 1943, a great deal of photo-roentgenographic work was done at the various Naval Training Stations and most recruits in those years had the benefit of such examination.

3) Since February, 1943, practically all applicants to the Navy have been receiving photo-roentgenographic chest examinations in the Selective Service Induction Centers throughout the United States.

4) Prior to February, 1943, the majority of rejections of recruits based upon roentgenographic evidence of tuberculosis were made at Naval Training Stations and necessitated "Invaliding from the Service due to tuberculosis which existed prior to entry into the Service."

5) Since February, 1943, the majority of rejections of recruits based upon roentgenographic evidence of tuberculosis are being

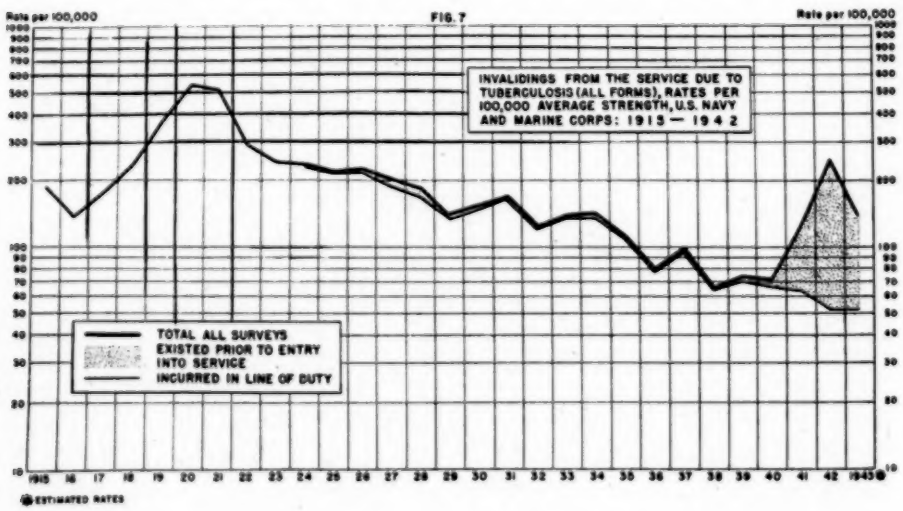


FIG. 7
Rate per 100,000
Rate per 100,000
INVALIDINGS FROM THE SERVICE DUE TO TUBERCULOSIS (ALL FORMS), RATES PER 100,000 AVERAGE STRENGTH, U.S. NAVY AND MARINE CORPS: 1915 — 1942
TOTAL ALL SURVEYS
EXISTED PRIOR TO ENTRY INTO SERVICE
INCURRED IN LINE OF DUTY
1915 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 1943
ESTIMATED RATES

made at the Induction Stations before the man actually enters the Navy thus obviating the need of "Invaliding" and substituting "Rejection."

With these facts in mind, it is obvious from Figure 7 that:

1) The rate for Invalidings for tuberculosis incurred in the line of duty, as differentiated from that for tuberculosis existing prior to entry into the Service, has followed a declining trend since World War I.*

*The division of Invalidings to include a separate category for "existed prior to entry into the Service" took place in 1926.

TABLE X

INVALIDINGS FROM THE SERVICE DUE TO TUBERCULOSIS (ALL FORMS), INCURRED IN LINE OF DUTY*, AND EXISTING PRIOR TO ENTRY INTO THE SERVICE*, INCIDENCE AND RATES PER 100,000 AVERAGE STRENGTH, U. S. NAVY AND MARINE CORPS: 1915 - 1943

Year	Average Strength	Invalidings From the Service					
		Total		Incurred In Line of Duty		Existed Prior To Entry	
		Number	Rate per 100,000	Number	Rate per 100,000	Number	Rate per 100,000
1915	68,075	126	185.09				
1916	69,294	94	135.65				
1917	245,580	433	176.32				
1918	503,792	1,197	237.60				
1919	298,774	1,105	369.84				
1920	140,773	754	535.61				
1921	148,861	772	518.60				
1922	122,126	359	293.96				
1923	116,565	283	242.78				
1924	119,280	283	237.26	275	230.55	8	6.71
1925	115,391	252	218.39	249	215.79	3	2.60
1926	113,756	254	223.28	249	218.88	5	4.40
1927	115,316	235	203.79	219	189.92	16	13.87
1928	116,047	215	185.27	196	168.90	19	16.37
1929	117,388	166	141.41	160	136.30	6	5.11
1930	117,453	181	154.10	172	146.44	9	7.66
1931	112,767	191	169.38	187	165.83	4	3.55
1932	110,717	137	123.74	136	122.84	1	0.90
1933	108,183	149	137.73	147	135.38	2	1.85
1934	109,383	156	142.62	150	137.13	6	5.49
1935	114,188	130	113.85	126	110.35	4	3.50
1936	124,408	100	80.38	97	77.97	3	2.41
1937	132,855	131	98.60	126	94.84	5	3.76
1938	139,216	93	66.80	90	64.65	3	2.15
1939	149,618	110	73.52	104	69.51	6	4.01
1940	202,614	147	72.55	135	66.63	12	5.92
1941	348,926	425	121.80	221	63.33	204	58.47
1942**	—	—	248.96	—	52.50	—	196.46
1943***	—	—	141.19	—	52.12	—	89.07

* The separation of total invalidings from the service into these two categories was not possible until the year 1924, the figures not being available.

** Provisional

*** Estimate based on preliminary examination of reports.

2) In World War I, tuberculosis was responsible for a large number of Invalidings from the Service, the rate rising to 535.61 per 100,000 average strength in 1920.

3) These rates slowly decreased in the years between World War I and World War II.

4) With the advent of the present conflict, the Invaliding rate rose sharply for 2 years, but the estimated rate for 1943 indicates a very significant decrease. This sudden decrease can be attributed to the above-mentioned plan of Induction Center roentgenographic examinations of applicants. In view of continued expansion of this practice, it is expected that the comparable rate for 1944 will fall still lower.

REJECTIONS AT RECRUITING STATIONS

Figure 8 and Table XII present the picture of tuberculosis as a cause of rejection in Navy and Marine Corps recruiting stations from 1916-1941.* For purposes of comparison, rejections for all causes and heart affections are also included.

It will be noted that the curves for all causes and for heart affections, though at grossly different levels, follow a similar pattern throughout the period studied. They very closely reflect the stringency or laxity of physical examination standards, which have, of

*The figures for 1942 and 1943 are not available.

TABLE XI

PER CENT OF TOTAL INVALIDINGS FROM THE SERVICE DUE TO TUBERCULOSIS (ALL FORMS) REPORTED AS HAVING EXISTED PRIOR TO ENTRY INTO THE SERVICE, U. S. NAVY AND MARINE CORPS: 1932-1942

Year	Total Invalidings	E.P.T.E. Invalidings	
		Number	Per cent Total Invalidings
1932	137	1	0.73
1933	149	2	1.34
1934	156	6	3.85
1935	130	4	3.08
1936	100	3	3.00
1937	131	5	3.82
1938	93	3	3.23
1939	110	6	5.46
1940	147	12	8.16
1941	425	204	48.00
1942*	...	...	78.91

*Provisional.

necessity, varied with the demand for and supply of manpower.

The curve for tuberculosis during the same period presents an entirely different picture. Between the years 1917-1929, a period of 13 years, the rejection rates remained relatively stable, though the curve does exhibit a downward trend which resulted in a decrease of 44.98 per cent between its beginning and end. However, during the 5-year period 1930-1934, there was a sudden decrease of 81.21 per cent. During the last 7 years of the curve, the rates resumed a certain degree of plateau-stability, but this time at a much lower level.

This sudden drop in the rejection rate for tuberculosis in the period 1930-1934 occurred despite the fact that we were in the midst of a severe economic depression, despite the fact that there were no changes in recruiting policies, and that physical standards were increased rather than decreased. The only explanation that can be offered is that of the general reduction of tuberculosis in the population as a whole. Any further explanations are left to the discretion of the reader.

Although the writers are unable to offer comparable statistics for 1942 and 1943, Table XIII may serve as an indication of the general effect of the incorporation of the Navy recruiting procedure into the

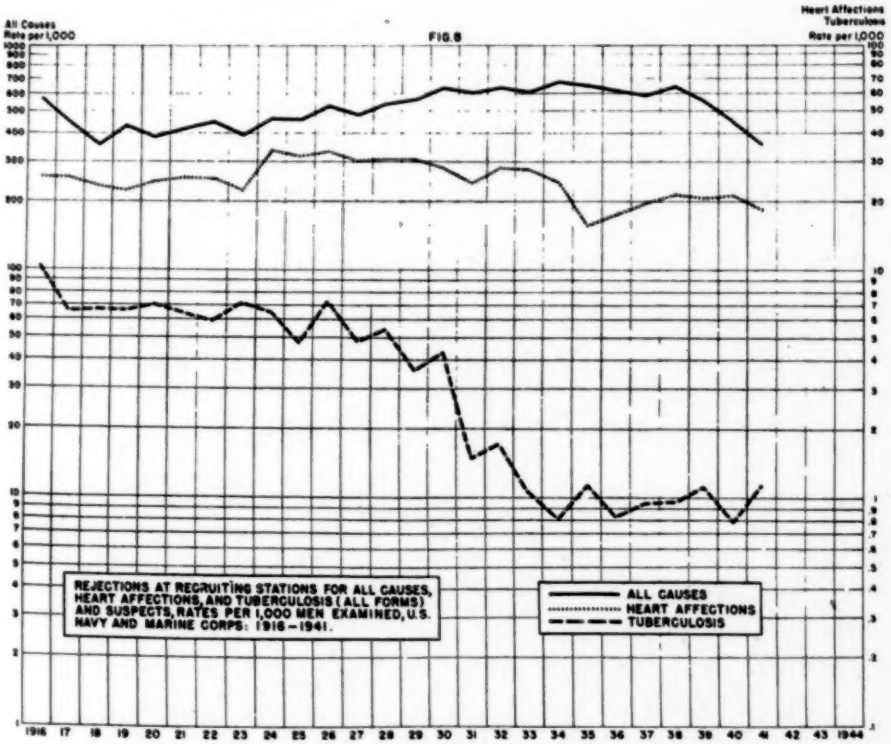

All Causes
Rate per 1,000
Heart Affections
Tuberculosis
Rate per 1,000
FIG. 8
REJECTIONS AT RECRUITING STATIONS FOR ALL CAUSES, HEART AFFECTIONS, AND TUBERCULOSIS (ALL FORMS) AND SUSPECTS, RATES PER 1,000 MEN EXAMINED, U.S. NAVY AND MARINE CORPS: 1916–1941.
ALL CAUSES
HEART AFFECTIONS
TUBERCULOSIS
1916 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 1944

TABLE XII

REJECTIONS AT RECRUITING STATIONS FOR ALL CAUSES, HEART AFFECTIONS, AND TUBERCULOSIS (ALL FORMS) AND SUSPECTS, INCIDENCE AND RATES PER 1000 MEN EXAMINED, U. S. NAVY AND MARINE CORPS: 1916 - 1941

Year	Number Men Examined	Men Rejected All Causes		Rejections For Heart Affections		Rejections For Tuberculosis (all forms) and Suspects	
		Number	Rate per 1000 Men Examined	Number	Rate per 1000 Men Examined	Number	Rate per 1000 Men Examined
1916	91,736	52,370	570.83	2,363	25.76	961	10.47
1917	494,897	220,678	445.77	12,708	25.67	3,259	6.58
1918	641,440	230,335	358.86	15,091	23.51	4,288	6.68
1919	187,716	80,667	429.71	4,143	22.07	1,239	6.60
1920	172,556	66,391	384.74	4,254	24.65	1,211	7.02
1921	72,282	30,031	415.45	1,866	25.81	468	6.47
1922	80,387	36,203	450.33	2,016	25.08	475	5.91
1923	103,736	41,030	395.49	2,303	22.20	745	7.18
1924	71,061	33,067	465.32	2,401	33.79	458	6.44
1925	58,817	27,330	464.64	1,874	31.86	282	4.79
1926	80,057	41,654	520.30	2,677	33.44	583	7.28
1927	97,607	46,894	480.42	2,956	30.28	469	4.80
1928	84,763	45,392	535.49	2,633	31.06	463	5.46
1929	85,175	48,409	568.32	2,630	30.88	308	3.62
1930	87,830	55,641	633.47	2,516	28.64	379	4.31
1931	87,510	52,819	603.56	2,109	24.10	129	1.47
1932	72,498	45,914	633.29	2,077	28.65	123	1.70
1933	72,029	43,415	602.77	2,003	27.81	81	1.12
1934	116,031	78,374	675.43	2,801	24.14	94	0.81
1935	119,939	79,802	665.31	1,897	15.82	135	1.13
1936	104,603	64,749	618.94	1,840	17.59	87	0.83
1937	100,584	59,319	589.69	1,986	19.74	96	0.95
1938	128,431	82,412	641.66	2,746	21.38	125	0.97
1939	141,356	78,133	552.71	2,922	20.67	159	1.12
1940	236,413	107,215	453.41	4,978	21.05	187	0.79
1941	387,129	138,547	357.87	7,122	18.40	442	1.14

TABLE XIII

INVALIDINGS FROM THE SERVICE REPORTED AS HAVING EXISTED PRIOR TO ENLISTMENT, TUBERCULOSIS, ACTIVE AND INACTIVE, ENLISTED PERSONNEL, U. S. NAVY AND MARINE CORPS: 1942-1943*

		Tuberculosis					
		Total		*Active*		*Inactive*	
Year	*Total All Causes*	*No.*	*% Total All Causes*	*No.*	*% Total T.B. IS's*	*No.*	*% Total T.B. IS's*
1942	16,892	1770	10.48	446	25.20	1324	74.80
1943**	36,948	1416	3.83	360	25.42	1056	74.58

*U. S. Naval Medical Bulletin: "Disabilities or Diseases Causing Separation from the Service."

**Estimate for calendar year based on reports received between January 1, 1943, and October 25, 1943.

Selective Service Induction procedure with its accompanying pre-induction roentgenographic examination.

This table provides a comparison of "Invalidings from the Service" for causes reported as having existed prior to entry into the Service during 1943 with similar statistics for 1942. As was indicated earlier in the paper, February, 1943, was the dividing line between Recruiting Station and Induction Station physical examination.

Due to a difference in handling the source material of this Table* in each of the two years under consideration, the rates indicating the ratio between Invalidings for tuberculosis and Invalidings for all causes are very conservative. The 1942 percentage is slightly lower than the true rate, while the estimate for 1943 is somewhat larger than that which will be the final rate.

Despite this fact, there still is evidenced a very significant difference between the two percentages. In the period of a single year, the percentage of tuberculosis found among Invalidings for all causes decreased 63.45 per cent.

Further evidence indicating the effectiveness of including roentgenographic examination as part of the applicant's original physical examination for enlistment is the fact that 78 per cent of all Invalidings from the Service were classed as EPTE in 1942 whereas in 1943 this ratio has dropped to 52 per cent.

In spite of the fact that chest roentgenograms will ". . . detect possible evidence of tuberculous infection in not more than one-fourth to one-third of the persons actually infected"[4] and in spite of the fact that in some instances as many as 50 per cent of the cases rejected on initial roentgenogram may be accepted after further study,[5] the roentgenographic examination still stands as a very important part of the Navy's tuberculosis-eradication program.

The writers feel fully justified in stating that the comparable picture for 1944 will indicate a still greater drop in the discharging of men from the Service because of tuberculosis.

SUMMARY

1) The rates for Original Admissions to the sick list for tuberculosis in the U. S. Navy have steadily declined in the past 40 years from a high of 671.83 per 100,000 average strength in 1903 to a low of 53.17 per 100,000 in 1942.

2) The rise in Admission rates and Invalidings from the Service at the beginning of the present war period due to tuberculosis is directly attributable to chronic, pulmonary, arrested tuberculosis. This increase is apparent rather than real, since it represents improved case-finding rather than more tuberculosis, and infection

*Report of Medical Survey, NMS—Form M.

existing prior to entry into the Service rather than that incurred in line of duty.

3) Death rates and noneffective ratios for tuberculosis (all forms) and particularly for tuberculosis, pulmonary, chronic, active, show a downward trend, the rate of decrease being accelerated in 1940. This drop in 1940 simply reflects the increased rate of invaliding men from the Service.

4) The first material advance toward eliminating tuberculosis from admission to the ranks of the U. S. Navy was the inauguration of mass roentgenographic examination at the Norfolk Naval Training Station in January, 1941. The subsequent expansion of this program greatly improved the Navy's case-finding, thus causing Admission rates and Invalidings from the Service to undergo sudden, precipitous increases. At the same time, however, this procedure also eliminated potential sources of tuberculous infection through the policy of separating these foci from the Service rather than retaining them on active duty.

5) The scheme which was placed into operation in February, 1943, in the Selective Service Induction Centers and which makes entrance into the Navy contingent, among other factors, upon a satisfactory photofluorograph of the chest appears to have approached even closer to a solution of the problem of keeping tuberculosis out of the Navy.

6) The Original Admission rates for all occupations in the Navy due to tuberculosis (all forms) have for many years been comparatively low, and, since 1922, have consistently followed a descending trend line. Despite this favorable trend, it is nevertheless true that three occupational groups, i.e., hospital corps, culinary and engine room, have maintained rates almost consistently above the mean rate for all occupations. The need for further study and effort in the solution of this problem is obvious.

7) Roentgenographic chest examination before entry, combined with roentgenographic and clinical studies upon the occurrence of clinical symptoms, will markedly reduce the incidence of tuberculosis in the Navy. That these devices alone, however, will effect the complete eradication of tuberculosis from the Navy is subject to question in the light of the results of a sample survey of the crew of a Navy cruiser. In this study, it will be recalled, 0.42 per cent of the ship's 713 enlisted personnel were found to possess clinical tuberculosis of severity sufficient to cause separation from the Service.

CONCLUSION

If the strategy of the U. S. Navy in combating the problem of tuberculosis were a defensive one aimed only at control of the disease, the results thus far obtained should be considered as entirely

satisfactory; the present program, including preinduction and chest radiography, radiographic and clinical studies on the advent of clinical symptoms, instruction in personal hygiene, a well-balanced diet, and a sanitary environment, should be considered entirely adequate.

Since the strategy is, however, one of offense and not defense, aimed not at mere control but at complete eradication of the disease, to the plan now in operation there should be added (a) periodic chest radiographic studies of all hands at intervals graded to the risk of exposure and the severity of the duty, supplemented by clinical studies including tuberculin testing when indicated; (b) special studies of the factors operative upon the hospital corps, culinary and engine room groups which might conduce to tuberculosis; (c) an increased appreciation on the part of all Naval medical officers of the importance of the chest roentgenograph in the prompt establishment of a diagnosis of pulmonary tuberculosis.

Given these additions, it would appear that the U. S. Navy, in the not too distant future, may fully realize the attainment of its goal—utter annihilation of tuberculosis.

RESUMEN

1) Las inscripciones originales en el registro de tuberculosos de la Marina de los Estados Unidos han disminuído invariablemente durante los últimos 40 años, descendiendo desde la alta cifra de 671.83 por cada 100,000 de promedio en las fuerzas navales en 1903, hasta el bajo punto de 53.17 por 100,000 en 1942.

2) Durante el período inicial de la presente guerra, el aumento de la proporción de enfermos registrados y de invalidados para el Servicio a causa de tuberculosis, ha sido atribuído directamente a tuberculosis pulmonar crónica estacionada. Este aumento es más aparente que real, pues representa adelanto en los métodos empleados para descubrir casos existentes con anterioridad al ingreso al Servicio, y no propiamente aumento de los casos de tuberculosis debidos a infección contraída en el Servicio mismo.

3) El coeficiente de mortalidad y la proporción de ineptos por tuberculosis de todas formas y, particularmente, tuberculosis pulmonar crónica activa, revelan una tendencia descendente, con aceleración del descenso en 1940. Este descenso en 1940 refleja simplemente el aumento en la proporción de hombres separados del Servicio por inválidos.

4) El primer adelanto importante tendiente a eliminar el ingreso de la tuberculosis a las filas de la Marina de los Estados Unidos fue la inauguración de exámenes roentgenográficos colectivos en la Estación de Entrenamiento Naval de Norfolk, en Enero de 1941. La extensión subsecuente de este plan resultó en gran adelanto para el

descubrimiento de casos en la Marina, y fue causa de que el coeficiente de inscripciones al registro de enfermos y de matrículas de inválidos en el Servicio manifestaran aumentos súbitos y precipitados. Sin embargo, este procedimiento también eliminó, al mismo tiempo, fuentes potenciales de infección tuberculosa gracias al plan de segregar a estos focos de infección en vez de retenerlos en servicio activo.

5) El proyecto que se puso en efecto en Febrero de 1943 en las Juntas de Ingreso del Servicio Selectivo y que obliga que el que ingrese a la Marina esté sujeto, entre otros factores, a una fotofluorografía torácica satisfactoria, parece haberse acercado aún más a la solución del problema de impedir la entrada de la tuberculosis a la Marina.

6) El coeficiente de las inscripciones originales por tuberculosis (de todas formas) en todas las ocupaciones de la Marina ha sido comparativamente bajo por muchos años y, desde 1922, ha seguido invariablemente un rumbo descendente. A pesar de esta tendencia favorable es cierto, sin embargo, que tres grupos de ocupaciones, a saber, cuerpo de hospital, culinario y de cuarto de máquinas han mantenido coeficientes invariablemente más elevados que el promedio de todas las ocupaciones. La necesidad de un mayor estudio y esfuerzo en la solución de este problema es evidente.

7) Examen roentgenográfico del tórax previo al ingreso, combinado con estudios roentgenográficos y clínicos cuando sobrevengan síntomas clínicos, reducirá decididamente la frecuencia de la tuberculosis en la Marina. Sin embargo, cabe la duda de que estos planes solos efectúen la extirpación completa de la tuberculosis en la Marina, a la luz de los resultados de un censo de muestra de la tripulación de un crucero naval. Se recordará que en este estudio se descubrió que el 0.42 por ciento del personal subalterno de 713 tenía tuberculosis clínica de suficiente gravedad para causar su separación del Servicio.

CONCLUSION

Si la estrategia de la Marina de los Estados Unidos para combatir el problema de la tuberculosis fuera defensiva, dirigida solamente al control de la enfermedad, los resultados obtenidos hasta ahora deberían considerarse enteramente satisfactorios; el plan actual, que incluye radiografía del tórax previo al ingreso, estudios radiográficos y clínicos cuando sobrevienen síntomas clínicos, instrucción en la higiene personal, una dieta bien regulada y un ambiente higiénico, debería considerarse enteramente adecuado.

Sin embargo, desde que la estrategia es ofensiva y no defensiva, dirigida no al mero control sino a la erradicación completa de la enfermedad, debe añadírsele al plan actualmente en efecto: (a)

estudios radiográficos torácicos periódicos de todo el mundo a intervalos calculados de acuerdo con el riesgo de contagio y lo riguroso del servicio, más estudios clínicos que incluyan pruebas tuberculínicas cuando estén indicadas; (b) estudios especiales de los factores operativos en el grupo del cuerpo de hospital, en el culinario y en el del cuarto de máquinas que puedan ser conducentes a la tuberculosis; (c) mayor apreciación de parte de todos los oficiales médicos de la Marina de la importancia de la roentgenografía torácica en el diagnóstico temprano de la tuberculosis pulmonar.

Dadas estas adiciones, es posible que, en un futuro no muy lejano, la Marina de los Estados Unidos alcanze por completo su objeto: la aniquilación total de la tuberculosis.

REFERENCES

1 *Annual Report of the Surgeon General, U. S. Navy.* U. S. Government Printing Office, Washington, D. C.; 1900-1941.

2 *Communicable Disease Records*, Division of Preventive Medicine, Bureau of Medicine and Surgery, Washington, D. C.

3 Yerushalmy, J.; Hilleboe, H. E., and Palmer, C. E.: "Tuberculosis Mortality in the United States—1939-1941," *Public Health Reports*, Washington, D. C., Vol. 58, No. 40, October 1, 1943.

4 Myers, J. A.: Review of Soderstrom's article entitled "Health Certificates," *Jour. of School Health*, May, 1943.

5 Koontz, Lt. Col. A. R.: "Cases Rejected for Army Service on the Basis of Chest Films Alone," *The Military Surgeon*, October, 1942.

A Study of Rejectees for Thoracic Abnormalities*

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When the Selective Service program was initiated in Wayne County, the Army was interested only in either acceptance or rejection of men for Service. With the terrific amount of work necessarily imposed on the limited staff there was little time for taking advantage of the knowledge gained from these examinations for other purposes.

Dr. Hudson was appointed to a Board of Review in an advisory capacity to check on chest rejectees. He initiated a plan, many features of which have been used throughout the United States. In this plan every chest rejectee was given a further physical examination at which time the original miniature Army film (4"x5") was checked with a standard celluloid film, 14"x17", the latter supplied locally by the Detroit Tuberculosis Sanatorium.

The results of this complete reexamination were forwarded to (1) the local Draft Board, (2) the private physician, (3) the State Department of Health, (4) the local Department of Health. In Detroit the Department of Health was thus officially notified and it in turn was able to include rejected draftees in its splendid municipal program dealing with tuberculosis. In this program contact is made with the patient's private physician for hospitalization where required and for the examination of household contacts, as indicated.

At the present time Advisory Board No. 20 is using the plan whereby only questionable abnormalities are further checked with large films. In other words where a physical examination, medical history and Army miniature x-ray show a complete and definite picture, the draftee is not required to have an additional large film. Only those rejectees in which there is some question of diagnosis or activity are now reexamined by the Detroit Tuberculosis Sanatorium with the standard 14"x17" celluloid film.

During the period March 28, 1942, to June 30, 1943, 1109 consecutive rejectees from Wayne County (Michigan) were examined for thoracic abnormalities. Unfortunately the figures for the number of draftees examined by the Army during the above period is not available at this time.

The findings in age group and color are shown in Table I. Of the total number of rejectees examined 139 (12.4%) gave a history of

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previous treatment for tuberculosis. Hospitalization was recommended for 114 (10.3%) of the rejectees, while many others were under treatment of private physicians and chest clinics, several following previous hospitalization. Of the 114 men recommended for hospitalization, a large number wished to continue working against medical advice.

Other findings not specified in Table I include six cases of healed tuberculous spine, four cases of occupational fibrosis, one bronchial asthma, one marked bronchiectasis, one empyema (healed) and one marked emphysema.

An interesting figure is that of 93 rejectees (8.4% of the total) showing a normal chest. Of the 48 observation cases (4.3% of the total) asked to return to Board 20 for final diagnosis, it can be assumed from past experience that there will be sufficient cases finally judged normal to increase the total of healthy chests to 10 per cent. These will be referred back to their respective Draft Boards as physically fit for service.

The presence or absence of symptoms among draftees is of questionable value. This is particularly true in the case of rejected draftees with the knowledge that they were rejected specifically for tuberculosis.

Occasionally rejectees, though claiming in one breath that they had severe symptoms, a few minutes later would inform the examiner that their jobs, often strenuous and frequently involving overtime work, had no harmful effect on them. This followed a suggestion from the examiner that the work was possibly the cause of the symptoms. In a few cases the rejectees then changed their story, denying symptoms "now." This phase was well reported recently by Brig. Gen. C. C. Hillman, who wrote: ". . . the individual is rare who does not have a definitely positive or negative attitude toward entering the Army."[1]

Table II shows reinfection tuberculosis classified in age groups. There is a surprisingly consistent picture for all age groups comparable with the general average. The average for all age groups of minimal disease was 61.0 per cent, of moderately advanced disease 31.0 per cent and for far advanced disease 8.0 per cent. In the minimal classification, the average of which is 61.0 per cent, the group under age 21 years shows 68.9 per cent with the percentage decreasing slightly as the age increases. In the moderately advanced group (average 31.0%) and in the far advanced group (average 8.0%) the percentage of cases increases as the age increases except for a slight deviation in the small group of far advanced cases, age 41 years and over.

The discovery of the large number of 609 cases of inactive tuberculosis (Table III) made it desirable to discuss with many rejectees the matter of changing to jobs which would be better suited for the

TABLE I

DIAGNOSES OF REJECTEES IN AGE GROUPS AND COLOR

Diagnosis	Under 21 yrs.		Ages 21-30		Ages 31-40		Ages 41 and over		Total		Grand Total
	W	C	W	C	W	C	W	C	W	C	
Negative	10	0	37	7	19	4	16	0	82	11	93
Primary, active	1	1	0	1	0	0	0	0	1	2	3
Primary, inactive	6	1	54	7	36	3	15	0	111	11	122
Minimal, active	4	3	19	3	14	3	10	0	47	9	56
Minimal, inactive	20	4	158	14	152	5	66	5	396	28	424
Mod. adv., active	8	1	33	2	20	4	18	1	79	8	87
Mod. adv., inactive	3	0	45	7	69	4	23	6	140	17	157
Far adv., active	2	0	13	0	11	3	5	1	31	4	35
Far adv., inactive	0	0	8	0	10	4	6	0	24	4	28
Hematogenous spread, healed	1	0	2	2	2	0	0	0	5	2	7
Miliary, healed	1	0	0	0	1	0	0	0	2	0	2
Pleurisy with effusion	0	0	0	0	0	0	0	0	0	0	0
Pleurisy without effusion	0	0	6	2	5	0	0	2	11	4	15
Pul. disease, non tbc.	2	0	4	0	1	0	3	0	10	0	10
Non pul. tbc.	0	0	7	1	0	1	2	0	9	2	11
Observation	6	1	20	1	11	1	7	1	44	4	48
Heart	0	0	1	0	1	0	1	0	3	0	3
Other	0	0	3	0	4	0	1	0	8	0	8
Total	64	11	410	47	356	32	173	16	1003	106	1109
Hospital recommended	11	5	32	3	27	7	26	3	96	18	114
Previously treated	6	0	46	7	52	2	21	6	124	15	139

physical limitations suggested by the findings. Though many of these men were doing laborious work and over extended hours without apparent physical breakdown, it can be assumed that reactivation of their pulmonary lesion would result in numerous cases unless proper rehabilitation was resorted to. In some instances this called for the recommendation of additional schooling to help procure more suitable jobs.

It is particularly interesting to compare the reinfection tuberculosis findings with those procured by other case finding procedures (Table IV). In addition to the draft rejectees, results are given for tuberculosis case finding in the Senior High Schools, in Fisher Lodge (housing homeless unemployed men) and by the usual means as reported by the Detroit Department of Health, including examination of patients with symptoms and of contacts of known cases.[2]

In the Senior High School group, ages 14 to 19 years, four-fifths of the reinfection tuberculosis cases discovered were minimal and one-fifth advanced. The findings by the usual means, on the other hand, were exactly the reverse, but one-fifth having minimal disease and four-fifths showing advanced disease. The Fisher Lodge examinations were divided approximately into half minimal and half advanced.

In the order of results procured the draft rejectee figures are next to those of the Senior High School students. The rejectees were approximately three-fifths minimal cases and two-fifths advanced cases, which compares very favorably with the one-fifth minimal and four-fifths advanced lesions discovered by the usual means. (It might be noted here that the examination of 30,000 recruits, ages 18½ to 45 years, for Women's Auxiliary Air Forces (Britain) shows a comparable value of this program among women.[3])

What will be the effect of this tremendous case finding program

TABLE II

REINFECTION TUBERCULOSIS CLASSIFIED IN AGE GROUPS

Classification	*Under 21*	*Ages 21 to 30*	*Ages 31 to 40*	*Ages 41 up*	*Total*
Minimal	31 or 68.9%	194 or 64.2%	174 or 58.2%	81 or 57.4%	480 or 61.0%
Mod. adv.	12 or 26.7%	87 or 28.8%	97 or 32.4%	48 or 34.1%	244 or 31.0%
Far adv.	2 or 4.4%	21 or 7.0%	28 or 9.4%	12 or 8.5%	63 or 8.0%
Total	45 or 100%	302 or 100%	299 or 100%	141 or 100%	787 or 100%

TABLE III

REINFECTION TUBERCULOSIS CLASSIFIED IN AGE GROUPS AND COLOR

Classification	Under 21		Ages 21-30		Ages 31-40		Ages 41 up		Total	
	W	C	W	C	W	C	W	C	W	C
Minimal, active	4	3	19	3	14	3	10	0	47	9
Minimal, inactive	20	4	158	14	152	5	66	5	396	28
Mod. adv., active	8	1	33	2	20	4	18	1	79	8
Mod. adv., inactive	3	0	45	7	69	4	23	6	140	17
Far adv., active	2	0	13	0	11	3	5	1	31	4
Far adv., inactive	0	0	8	0	10	4	6	0	24	4
Total, active	14	4	65	5	45	10	33	2	157	21
Total, inactive	23	4	211	21	231	13	95	11	560	49
Total, reinfection	37	8	276	26	276	23	128	13	717	70
Total draftees examined	64	11	410	47	356	32	173	16	1003	106

9.5% Colored

now being carried out by the Army? Beneficial results in the community are bound to follow—perhaps there is already evidence of this in recent local high school findings.

The students of a senior high school, age 16-18 years and 10 per cent colored, were tested annually from 1933 through 1941. In 1942 this school unfortunately was not included in the case finding program because of heavy demands elsewhere. The results of the examinations for the year 1943 are most interesting when compared with those of the previous years.

It is seen that reinfection tuberculosis was found each year in the period 1933-1941 and varied from 0.32 per cent of those examined to 1.1 per cent with a total of 51 cases or an average of 0.74 per cent for the 9 years among 6,719 examinations. In 1943 only one case was discovered among 752 students or 0.13 per cent.

SUMMARY

The draft rejectees are a cross section of the adult male population of selected ages. The results show the value of mass tuberculosis case finding among the male population of these ages, with the finding of three fifths minimal cases as compared with one fifth by the usual means. (Similar results can be expected from tuberculosis case finding among women.)

Unquestionably many early lesions and occasionally moderately advanced lesions go on to what might be called spontaneous healing, without having produced appreciable symptoms or necessitating even the temporary giving up of employment.

Tuberculosis thus may present itself as (a) symptomatic, (b) asymptomatic. Asymptomatic tuberculosis, especially at the begin-

TABLE IV

COMPARATIVE TUBERCULOSIS CASE FINDING RESULTS

	Minimal	*Mod. Adv.*	*Far Adv.*	*Total*
Senior High School Students Ages 14 to 19	28 cases or 82.4%	6 cases or 17.6%	0	34 cases or 100%
Draft Rejectees	480 cases or 61.0%	244 cases or 31.0%	63 cases or 8.0%	787 cases or 100%
Fisher Lodge Ages 21 upwards	11 cases or 52.4%	5 cases or 23.8%	5 cases or 23.8%	21 cases or 100%
Usual means Ages 16 upwards	28 cases or 19.1%	54 cases or 36.7%	65 cases or 44.2%	147 cases or 100%

ning, is more frequently the rule than the exception. Unsuspecting people having tuberculosis can therefore act as innocent tuberculosis carriers.

The Army is to be congratulated in making chest roentgenography a routine part of the physical examination for Army acceptance. Its very good example is now being followed in civilian life by industry.

The mass x-ray screening by Selective Service will prove to be an immeasurable aid in removing tuberculosis from the community.

Finally, this Board is greatly appreciative of the fine spirit of cooperation shown at all times by Colonel Owen's office and by all local Draft Boards, without exception.

RESUMEN

Los hombres rechazados en la Conscripción son representativos de los varones de la población adulta de las edades seleccionadas. Los resultados demuestran el valor de la pesquisa colectiva de casos de tuberculosis entre la población masculina de estas edades, con el descubrimiento de tres quintos de los casos en el período mínimo comparado con sólo un quinto descubierto con los medios ordinarios. (Puede contarse con resultados semejantes en la investigación de casos de tuberculosis entre las mujeres.)

Indudablemente muchas lesiones tempranas y, de vez en cuando, lesiones moderadamente avanzadas, terminan en lo que podría llamarse curación espontánea, sin haber producido síntomas perceptibles o sin haber requerido ni aún el abandono temporal del empleo.

La tuberculosis, pues, puede presentarse en forma (a) sintomática o (b) asintomática. Tuberculosis asintomática, especialmente al principio, es, con más frecuencia, la regla que la excepción. Por consiguiente, personas que no sospechan que tienen tuberculosis pueden servir de inocentes portadores de la enfermedad.

Debe felicitarse al Ejército de los Estados Unidos por exigir que la roentgenografía torácica sea parte rutinaria del examen físico necesario para el ingreso en el Ejército. Su muy buen ejemplo lo está imitando actualmente la industria en la vida civil.

El examen radiográfico colectivo, llevado a cabo por el Servicio Selectivo, demostrará ser de una ayuda inmensurable en el exterminio de la tuberculosis en la colectividad.

En conclusión, esta Junta agradece mucho el admirable espíritu de cooperación demostrado en toda ocasión por la oficina del Coronel Owens y por todas las Juntas de Conscripción locales, sin excepción.

REFERENCES

1 Hillman, Brig. Gen. Chas. C.: "The Tuberculosis Problem in the Army," *Dis. of Chest*, 9: 267, 1943.
2 Shurly, Burt R., and Brachman, D. S.: "Latent Sources of Contact in Tuberculosis," *Am. Rev. Tuberc.*, 34: 96-106, 1936.
3 Foreign Letters, *J. A. M. A.*, 123: 49, 1943.

The Problem of Tuberculosis in Apparently Healthy Man as Shown in the Routine Examinations for Induction into the Armed Forces

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The medical profession is confronted with a tremendous responsibility in providing intelligent guidance for men rejected for military service because of pulmonary tuberculosis. This disease has been a scourge of the human race so long that it is more or less accepted as one of the evils which we must endure. Its insidiousness and unspectacular behavior also contribute to a general feeling of indifference. We have become so hardened to the loss of 60,000 lives each year in the United States that we forget every one of them might have been prevented. World War II with the resultant physical examination of millions of apparently healthy men has brought us face to face with the problem of providing medical care for many thousands rejected because of previously unsuspected tuberculosis.

We will not know the magnitude of this problem until the close of the war. However, we do know that the number of men rejected for tuberculosis is reaching alarming proportions. While accurate figures are not yet available, the rejection rate is averaging approximately 1.9 per cent of all those passing through the induction boards. In Pennsylvania alone the number already exceeds 15,000 When we consider that the majority of those rejected had no idea of the existence of tuberculosis prior to their examination, the problem becomes more difficult.

The requirement of a routine chest roentgenogram by military authorities has resulted in the biggest tuberculosis case-finding program ever attempted in the history of this country. Its value from an economic point of view cannot be questioned. We are familiar with what happened in World War I when physical examinations alone were used to determine the presence or absence of tuberculosis in the candidates for military service. Stethoscopic examination of the lungs lends itself to a high percentage of error even when done by an experienced physician. As a result, thousands of men were accepted with unrecognized lesions in their lungs which flared into active disease at a later time. How much of this activation was due to military service cannot be determined. However, they have been cared for by a generous government which is still

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paying the bill twenty-five years later. The Federal Government has already spent in excess of a billion dollars for hospitalization, compensation and insurance for these men. We have no means of estimating what percentage of this group would have become responsibilities of the State had they retained their civilian status. Probably the number would have been large and perhaps they are fortunate to have become eligible for Federal care.

Today military physicians have the advantage of twenty-five years of experience in tuberculosis diagnosis. They do not depend on physical examination alone but are using the far more efficient method of rapid chest roentgenography. Speed and accuracy, both important factors, are provided by improved technical equipment and better trained personnel. The government has set a high standard of disqualifying pathology in its determined effort to keep tuberculosis at a minimum in the armed forces. On this basis some men may be disqualified unnecessarily but such errors are certainly on the side of safety. Those who are rejected must continue in civilian life where they become the responsibility of the medical profession.

The physicians of the induction boards have neither the time nor the facilities to do more than inform them of the reason for their disqualification. Under the present system they are reported to the state health departments and then referred to their family physicians or to tuberculosis clinics for further observation and treatment.

From a medical standpoint the rejectees fall into three groups. The first group includes those who have minimal healed disease, probably not of clinical significance but of a degree not acceptable to the army. In most instances with proper guidance they can return quite safely to their regular occupations. However, such a diagnosis of tuberculosis without a detailed explanation of its significance is unfair to the individual. To most of them the diagnosis of tuberculosis on their rejection papers means something to be feared. They cannot differentiate between primary infection, reinfection disease, and the numerous other diagnostic nomenclature which have been used. Therefore, in order to dispel any undue fear, it is important that they be given a careful explanation of their condition. They must also be given advice as to the significance of their trouble. We have seen a fair number of this type and in some instances our best efforts have failed so far to nullify the mental shock of the rejection diagnosis. Some have had difficulty in obtaining employment; some have been embarrassed in their social contacts; and some have been refused life insurance.

The second group is made up of those men who have demonstrable disease of undetermined stability. Their future depends upon good

medical advice. The fundamental problem is to determine the degree of activity of the lesion which was the basis for his rejection for military service. To determine the stability of a lesion is one of the most difficult phases of tuberculosis diagnosis. Since we have no definite criteria which are applicable to all individuals, we are confronted with the problem of evaluating factors which may have a definite bearing on the diagnosis. As a result, each patient must be judged by findings peculiar to his situation. Most of the men in this group have no sputum or sputum negative for tubercle bacilli. It must be borne in mind that a positive sputum is the only single finding which by itself will establish a diagnosis of active tuberculosis. But in the absence of a positive sputum, active tuberculosis may still exist. Many tuberculous lesions are unstable or even progressive when sputum is absent or negative. Therefore, the patient must be carefully studied over a period of time from a broad medical point of view. While a great deal of information can be obtained by intelligent interpretation of a chest roentgenogram, x-ray alone except in comparatively rare instances will not tell us the amount of activity.

Certain other basic information must be secured. A careful history must be taken in order to discover whether the patient is being exposed to tuberculosis in his family or whether there is known contact from other sources. Also previous unexplained illnesses, hemoptysis, or recurring pleurisy are of possible significance. Symptoms such as cough, expectoration, fatigue, lack of endurance and gradual loss in weight must be taken into account. Physical signs in the nature of localized rales in the upper lung areas are important. However, when dealing with these minimal pulmonary lesions, stethoscopic examination has a limited value because signs are so frequently absent. It has become apparent with the more common use of x-ray that even extensive pulmonary pathology may be entirely silent. A blood sedimentation rate may be used in determining active infection. While it is a valuable procedure, its limitations must be recognized.

Certain other factors must be taken into consideration. Age is extremely important. An excessive, apparently healed, primary tuberculosis is less significant in a man beyond forty years of age than it is in a boy whose age is eighteen years. We know that in this younger age period the danger of reinfection tuberculosis, either endogenous or exogenous, is greater than in the older age brackets. Therefore, particular precaution must be exercised inasmuch as the majority of men coming up for military service are in this age group where we normally have our highest tuberculosis mortality. Race must also be considered. We know very little about the immunological factors which control the behavior of a tubercu-

lous infection. It is well recognized, however, that some races do not tolerate the disease as well as others. For instance, an apparently healed lesion in a Negro is potentially more dangerous than the same extent of pathology in a member of the white race. The constitutional make-up of an individual or the presence of some intercurrent condition such as diabetes or a metabolic disturbance has an important bearing on the potentialities when tuberculous pathology is present. Nutrition, social status, environment, habits of living and the nature of his employment together with the amount of rest must be considered. An evaluation of all of these factors along with the information derived from x-rays made at stated intervals will give us a fairly accurate idea of the stability of the pathology in question and form the basis for advice to the patient as to his future activities. Some may need a preliminary period of hospital study but most of them can continue at home under the guidance of their own physician. In many cases it is merely a question of establishing their work tolèrance. A change of job may be necessary or perhaps retraining through a rehabilitation service will keep them safe and self-supporting. However, when hospitalization is not necessary, the potential danger of their infection must not be minimized to the extent that they will abandon all caution. Prolonged medical and social follow-up will protect their future and prevent a great deal of expensive hospital treatment.

The third group is composed of those who unquestionably have active pathology. The majority are in an infectious stage of the disease and should have hospital care. Their chance of recovery depends upon adequate treatment which can best be provided in a tuberculosis hospital. Their isolation is desirable for the protection of those with whom they are in contact.

SUMMARY

The medical profession has followed the conservative idea of waiting until a patient becomes sufficiently ill to seek advice. Thus, they have always been handicapped in the treatment of pulmonary tuberculosis because of the fact that a patient ordinarily is not seen until he has symptoms. In tuberculosis this can only lead to grief for by the time symptoms appear the disease has passed the optimum period for treatment. For years tuberculosis authorities have advocated the use of chest x-rays of the apparently healthy as the best known method of determining early tuberculosis. Impetus has been given to this procedure by the mature decision of the military authorities to apply it as a part of their physical examination of recruits. They consider routine chest x-rays a highly economical procedure in that it will keep tuberculosis in the armed forces at a minimum and so relieve the government of much expensive treat-

ment in the future. Unless the medical profession takes an intelligent interest in the men disqualified by the military authorities because of tuberculosis, this effective case-finding procedure will lose much of its value as applied to the prevention and control of tuberculosis in the civilian population. It must be remembered that tuberculosis is a communicable disease and as such is a public health problem.

RESUMEN

La profesión médica se ha acostumbrado a la idea conservadora de que el paciente espere sentirse suficientemente enfermo para consultar al médico.

Así es que siempre ha existido una desventaja en el tratamiento de la tuberculosis pulmonar debido al hecho de que, generalmente, no se ve al paciente sino hasta cuando ya tiene síntomas. En la tuberculosis ésto no puede dejar de causar pesadumbre, porque cuando aparecen los síntomas la enfermedad ha pasado ya el período mejor para su tratamiento. Los especialistas en la tuberculosis han abogado durante muchos años por el empleo de radiografías torácicas de sujetos aparentemente sanos como el mejor método conocido de terminar la existencia de la tuberculosis incipiente. Se le ha dado ímpetu a este procedimiento con la decisión razonada de las autoridades militares de incluirlo en el examen físico de los reclutas. Ellos consideran estas radiografías torácicas rutinarias un procedimiento muy económico, ya que reducirá al mínimo la tuberculosis en las fuerzas armadas y así le ahorrará al gobierno, en el futuro, mucho tratamiento costoso. A menos de que la profesión médica se tome un interés sensato en los sujetos rechazados por las autoridades militares debido a tuberculosis, este eficaz procedimiento de descubrimiento de casos perderá mucho de su valor en su aplicación en la prevención y control de la tuberculosis en la población civil. Debe recordarse que la tuberculosis es una enfermedad contagiosa y, como tal, constituye un problema de salubridad pública.

Post-War Teaching of Tuberculosis*

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In an attempt to discuss post-war teaching of tuberculosis, it seems appropriate to make a few observations concerning the accomplishments and the shortcomings in the control and treatment of tuberculosis in the light of the facts as we face them today.

We are extremely gratified with the significant drop in the mortality rate in tuberculosis in all of its forms during the past two or three decades. However, tuberculosis is still the greatest cause of death in the age group of 20 to 40, while it is said that over half of all deaths in the young women of our country between the ages of 18 and 25 are caused by tuberculosis.

Another significant fact is that the mortality rate per tuberculous patient is not showing any appreciable fall, certainly not one in proportion to the falling general mortality rate of the disease. From all this we may conclude that the campaign of health education among the people has made vast improvement in health, hygiene, etc., but the physician has been lax, delinquent in the tuberculosis fight. This is a severe indictment but a study of the whole tuberculosis problem bears out this indictment. It is the family physician, not the specialist who in most instances sees the tuberculosis patient first; it is his responsibility to make the diagnosis and institute the proper treatment or refer the patient to a specialist or a sanatorium. It is a well recognized fact that the physician in general practice is the keystone in the whole structure of tuberculosis control. The family physician has the confidence of his patient and his patient's family. He is in a position to get his patient to do what he should to prevent the spread of the disease and to regain his own health. Proof that the family physician has failed in a great majority of cases is the fact that more than 50 per cent of patients entering sanatoria are in the advanced stages of the disease. This alarming situation exists because the average physician is not tuberculosis-conscious. There is also another side of the picture. There are a great many problems we chest specialists who are tuberculosis-conscious have not solved as yet. Many questions remain unanswered for us because of the lack of tuberculosis-consciousness on the part of the medical profession as a whole since the anti-tuberculosis campaign was inaugurated. Some of these questions are as follows:

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*Presented before the Annual Meeting, Texas Chapter, American College of Chest Physicians, Sanatorium, Texas, April 23, 1944.

Why is the death rate of girls nearly twice that of boys in the age group 15 to 19?

Why is the death rate for women 44 per cent higher than men in the age group 20 to 24?

Why have these variations become greater in recent years?

Why do we not know whether the death rate is higher or lower among the privileged pupil class or among those of school age who are either at work or not in school?

Why have we intensive health activities for the infant, the pre-school child, the elementary school child, mothers, men in industry, and not a health program for the millions of boys and girls, young men and young women, some in school and some at work, who must necessarily make their physiological, mental, moral, economic and social adjustments during this critical period? Why has the death rate declined the least in this age group, a group which must "carry on" for the entire country? Why is there such a close relationship between psychoneurosis and pulmonary tuberculosis? Why is pulmonary tuberculosis commonly called "the scourge" among the hopelessly insane? Why do insane patients who cooperate fail to improve, not even ideal pneumothorax cases?

These and many other highly important questions remain to be answered because of the lack of tuberculosis-consciousness.

Another glaring example of the lack of interest in the subject of tuberculosis on the part of the medical profession is the fact that probably 99 per cent of our chest specialists become interested in the subject only after they themselves contract the disease.

Surveys completed both by the American Medical Association and the American College of Chest Physicians show that in the great majority of medical schools under the present system of teaching tuberculosis, the student does not have an opportunity to familiarize himself with the various phases and different stages of tuberculosis or to follow cases through access to clinical history, serial x-rays, or by periodic contact with the patient in order that he may be taught the clinical course of the disease. The student usually sees tuberculosis at its worst in the wards of the general hospital or in the out-patient clinics, where, for the most part, the opportunity for the patient to overcome his disease is unfavorable because the majority of cases presented are in the advanced stage. For this reason, the medical student does not become interested in the disease and develops only a vague idea of the whole subject of tuberculosis upon his graduation. Many young doctors want to avoid the disease because to them it is a hopeless proposition and many young medical graduates have actually developed phthisiophobia.

Improvement of the teaching of chronic diseases of the chest in

medical schools has been one of the major objectives of the American College of Chest Physicians since 1936.

It has been recognized by most of us for a long time that this is not only one of the most important but one of the most neglected factors in the anti-tuberculosis campaign. (1) The Council on Undergraduate Medical Education of the College under the able leadership of Dr. E. W. Hayes has made several surveys of our medical schools and has outlined courses of study applying to diseases of the lungs and submitted this outline to the deans of all our medical schools for consideration. This Council found that no more than 12 or 13 schools in the United States are giving adequate instruction on the subject. In 1939, the Chairman and some of the members of this Council, together with some members of the committee on Undergraduate Medical Education of the National Tuberculosis Association, met with the Secretary of the Association of Medical Schools. There was unanimous agreement at that time by these men that the manner in which the subject of chronic diseases of the lungs as taught in the great majority of medical schools today is exceedingly bad. A further study of the surveys made by this Council showed except for a few instances that tuberculosis is little more effectively taught now than it was 20 years ago. These studies also show that there is no comprehensive uniform system being used and that the student is offered the subject in a piecemeal fashion. There is little or no attempt to correlate the clinical, pathological, laboratory, the x-ray, the psychological and the social aspects of the disease. The survey also shows that the subject of tuberculosis is usually offered by internists and not by chest specialists.

(2) In 1942, Dr. E. W. Hayes, in an address given before the 52nd Annual Meeting of the Association of American Colleges, presented a comprehensive schedule for the teaching of tuberculosis in medical schools. The universal explanation by deans, professors of medicine and administrative authorities for the existing condition was that there was insufficient time to expand on the subject of tuberculosis. The Council on Undergraduate Medical Education of our College has insisted from the beginning that more time is not necessary; they only insist that the time now allotted the subject be better utilized and arranged. The schedule submitted allows for a maximum of 185 hours and a minimum of 76 hours during the four-year medical course. The submitted schedule is sufficiently elastic as to be adjusted easily to the curriculum of any medical school.

It has never been the idea of the Council representing the American College of Chest Physicians that the medical student should be made a specialist of tuberculosis, but that he should be given a

practical understanding of the essential procedure in diagnosis, treatment and prevention of the disease.

Despite the good efforts of our Council and despite the fact that even the medical schools admit the subject of tuberculosis has been, and is, badly presented to the medical student, little has been accomplished in the way of improvement of the situation.

Since the outbreak of World War II and our participation in it, the medical schools have modified their course and have adopted the continuous session plan in order to place more physicians at the disposal of the armed forces. This procedure will no doubt be continued for the duration of the war and possibly for a long time thereafter. I believe it is reasonable to state that as our experience grows so must our educational methods change and develop. It is to be hoped that the medical student of today will have instructors who pass lightly over the obsolete and present carefully those subjects upon which the student can best spend this period of training. Time spent in the study of medicine should not be wasted. During these days of rapid changes in medicine we are undergoing an even greater change in social affairs, as well as educational procedures with which medicine is so closely involved.

A great Texas educator said to me recently: "We teachers have learned a lot from Uncle Sam about the educative process. Since the institution of the G. I. streamlined method of teaching, no longer is it necessary to spend four years in college to learn a foreign language and then spend a lifetime interneship in a foreign country trying to find out just what it was you learned about the language in college." These G. I. methods of education will be strongly entrenched following the war and certain necessary adjustments will have to be instituted. With the war, changes in medical education were inevitable. Pre-medical requirements have been reduced from three or four years to two years of college work. The medical course proper has been accelerated by concentrating the work of four academic years into three calendar years. For this reason, and the universal excuse, namely, lack of time, it seems highly improbable that we will be able to accomplish much in the improvement of teaching diseases of the chest at this time. After the war, the status of medical education will of course depend primarily upon the conditions prevailing at that time. Assuming, of course, that we will be victorious, the termination of the war will require decisions as to what changes in medical and pre-medical education shall be made.

It has been aptly said by one of our greatest young college presidents that: "Any great crisis tends to reflect the weakness of the nation's educational program. The schools have always acted as mirrors in which the various factors contributing to civilization are reflected. This present emergency is no exception. The schools are

definitely reflecting the weakness of our society, which in turn emphasizes failures of the educational program in the immediate past. It is most urgent, therefore, that every attention be given to our total educational program in order that as many errors as possible be eliminated from the post-war-training."

The findings and developments of this war will contribute a very great deal to the educational emphasis in the period just ahead. Probably no field will profit more than the field of medicine. The professional school of tomorrow therefore must keep closely attuned to these immediate developments and must offer all possible facilities to the refinement of thought and practice.

The glaring weakness which this emergency has reflected is in the under-pinnings of our professional and highly skilled men. Indeed, the specialist is penalized by the very nature of his training. This penalty in turn reflects itself in the social order about him. American Government, American Economy and the American Way of Life are largely taken for granted. There has not been a clearly defined conception of the place of the professional man in a well rounded social order. Topsy-like, we have tended to leave the social developments of the individual to chance and too often he has simply "grown up." Everywhere there is a decided feeling of dissatisfaction relative to this condition. Business and professional men alike are condemning the schools for this weakness and are demanding that something be done about it. This situation is healthy if business and the skilled professions recognize their obligations along with the obligations of the schools. Unified attention must be given to this problem if civilization is to move on and out.

The curriculum for the professional man must emphasize that sort of training which prepares him to live in a society with others and to contribute to its social well-being, as well as to contribute his skill and his intellectual learning to its scientific welfare. Schools of medicine will find it difficult to remove certain specific courses in the curricula. The answer will possibly be found in a lengthened period of growth. This war has taught us a great deal about "lost motion" in our educational program. The schools of tomorrow cannot afford to let their plants lie idle during precious months. If this new concept is to be attempted, education must function twelve months of the year and not for a fraction thereof. Unnecessary holidays and a vacational period for loafing are probably things of the dead past. Industry has been pressed hard to win this war. Schools must be equally hard pressed to win and preserve the peace.

This program will certainly demand the cooperative understanding of industry, skilled professions and the schools all working hand in hand. Much more use must be made of clinics and laboratories while the youth is in school. Much that has been deferred until

post-school life may be included in the program of the school. This is the profession's responsibility along with the responsibility of the school.

Here, then, is our opportunity and our responsibility. We must have a part in the reshaping of this new post-war educational program in our medical schools. The Council on Undergraduate Medical Education of the College has worked long and hard and is now asking the help of each of us. I believe the following plan will fit in closely with the ideas of the Council:

Each chapter of each state should form a sub-council, a subsidiary, if you please, of the parent council of the College, the sub-council to have a chairman and the members of the sub-council to consist mainly of the fellows who live nearest the medical colleges of their state, the sub-council of each state to formulate a teaching schedule on the subject of tuberculosis, using as a guide the schedule already worked out by the parent council. These sub-councils should also concern themselves with a post-war pre-medical course.

It is believed by most educators that the pre-medical course should be extended to four academic years, streamlining the course to three calendar years. In this way many subjects may be added, such as Government, Economics and the Social Sciences. There should be a strong English course, and at least one foreign language besides the basic sciences. If such a pre-medical course is required and provided, not only will our medical graduate be better prepared to meet the ever-changing social conditions but he will be in a position as a student to expect and probably demand from his medical school more in the way of practical teaching methods, clinical facilities and evaluation of the social, environmental and economic factors related to the treatment and welfare of the patient.

After the sub-council has completed its proposed schedule, both for the medical school and the pre-medical course, which, after all, is laid down by the medical school, a meeting should then be arranged between all the members of the sub-council and the dean, professor of medicine and the administrative authorities of the medical school. It would also be helpful if the sub-council would present its plan to the County Medical Societies through their Tuberculosis Committees and to the State Medical Association through its Tuberculosis Committee. I believe this would strengthen the position of the sub-council and insure the support of the whole profession of the state.

The Council of the College also believes that it is highly probable that if a group of chest specialists would offer an elective course on tuberculosis in the school nearest their home the medical school would accept this offer. It is believed that if such a course is made sufficiently attractive, a great many students would elect the course.

After a time, there would no doubt be little difficulty in having such a course made a regular part of the curriculum of the medical school.

The sub-council on medical education of each chapter should also consider a postgraduate program. Many medical officers returning from the armed forces will desire postgraduate opportunities. Plans are now being made for a number of hospital or sanatorium appointments and it is hoped financial assistance will be available both to the returning officers and the institutions furnishing postgraduate opportunities. In a recent survey[3] completed by the Council on Medical Education of the American Medical Association it was found that there are now seven postgraduate courses offered for an enrollment of a total of 62 postgraduate students. It is also found that there are 303 residencies in existence now.

The Council on Pan-American Affairs of the American College of Chest Physicians under the chairmanship of Dr. Chevalier Jackson has recently furnished the Coordinator of Inter-American Affairs a comprehensive summary of 92 institutions in the United States, all of which have expressed their willingness to cooperate by accepting one or more physicians from the other American countries for postgraduate education in tuberculosis. All of these institutions have facilities for teaching diagnosis and treatment of diseases of the chest. This healthy interest on the part of these institutions is encouraging and I believe the Sub-Council of Medical Education may be able to enlist the interest and support of many other institutions in providing postgraduate instruction and rotating residencies.

It occurs to me that a valuable adjunct to the teaching of tuberculosis would be a new textbook or handbook on tuberculosis, probably better, a handbook on chronic diseases of the lungs. This handbook should be just that, not a voluminous affair but a practical, readable, well-illustrated book, compiled by collaborating authorities, each chapter to be written by a specialist on the subject of the chapter. The subject should be treated in a short, concise manner, eliminating all obsolete material. Without going into detail about the arrangement of the chapter heads, this book obviously should contain chapters on epidemiology, causes, symptoms, diagnosis, treatment, etc., and, in addition to these, it is felt that chapters on the following subjects would be helpful, namely: Social and Economic Aspects, Case Findings and Contacts, Public Health, Occupational Therapy and Rehabilitation. It is also my opinion that a chapter on Fatigue should be included because the connection between fatigue, the general health and tuberculosis is indicated by statistics on the occurrence of illness among workers of different types. Death rates by occupation[4] collected in the United States by

the National Tuberculosis Association show that an excess of accidents account for only one-sixteenth of the total excess of death rates of industrial workers, whereas an excess of pneumonia is nearly twice as important and an excess of tuberculosis nearly three times as important. Last, but not least, it is believed that a chapter of psychosomatic aspects of tuberculosis[5] must necessarily be considered both in the prevention and in the treatment of tuberculosis. Those of us who have lived in institutions where one can follow hundreds of cases of tuberculosis, I am sure, will agree with the psychiatrist that the nature of many adults suffering from clinical tuberculosis is that of a child—selfish, self-centered, irritable, easily angered, capricious with their food; their infantile reactions, in many cases, are so strong that they totally disregard others. Many are egotistical, dissatisfied and ungrateful, and, in many cases, these infantile symptoms are used by the individual patients to insure care and affection from their environment. Personality conflicts and mixed personalities may lead to behaviors in such a way as to interfere with healthy living and these reactions may become a most significant factor in the onset and course of clinical tuberculosis. Therefore, no case of tuberculosis should be measured by the history of the disease itself. It is well to remember that in the majority of cases there is a second history inside them, beyond that which is usually obtained by the physician when first consulted. This second history is usually the story of how they have been living when the disease or a relapse appeared. At any rate, incidents of emotional factors in the etiology and progression of tuberculosis must be taken into consideration in future plans for the control as well as in the treatment of this disease.

Dr. Lyman Wilbur[6] said recently in an article in the American Medical Journal: "There is no escape from the steady growth of new phases in the practice of medicine and surgery. If the physician can participate in and guide these changes, all will profit more. If he does not, others will—it is inevitable that more and more subsidiary help will be needed to make it possible for the carefully trained physician to do what he is trained for. Nurses, laboratory workers, physical therapists, technical assistants, secretaries, etc., multiply what the physician can do for his patient and the public, but all of these should be organized by the physician and not for him."

We know that tuberculosis is the seventh greatest cause of death in this country and the greatest cause in the age group of 20 to 40, our most productive age group. We know that in spite of these facts our doctors are not given the proper training in tuberculosis during their student days. We know much to our dismay that the decline in the number of tuberculosis patients has been largely brought

about by a campaign of prevention carried out for the most part by lay workers. In other words, the medical profession because of the lack of training in the varied aspects of tuberculosis has lost the ball. It is now in the hands of others.

The medical profession as a whole, therefore, has a great responsibility, a great duty, and a great opportunity in the coming postwar era. The same is true for the fellows of the American College of Chest Physicians.

We must put forth every effort to assist the Council on Undergraduate Medical Education of the American College of Chest Physicians to bring about the so much desired improvement in all phases of medical education, including the subject of tuberculosis. If we do this, we will accomplish much for ourselves and much more for humanity.

REFERENCES

1 Hayes, E. W.: "Tuberculosis in Curricula of Medical Schools," *Diseases of the Chest*, 5: 14-17, 1939.

2 Hayes, E. W.: "The Teaching of Tuberculosis," *Journal of the Association of American Medical Colleges*, July, 1942.

3 Council on Medical Education and Hospitals: "Postwar Graduate Medical Education," *J. A. M. A.*, 124: 40, 1944.

4 Sayers, R. R.: "Major Studies of Fatigue," *War Medicine*, 2: Sept., 1944.

5 Hartz, Jerome, "Tuberculosis and Personality Conflicts," *Psychomatic Medicine*, 6: 17-22, 1944.

6 Wilbur, R. L.: "Medical Education Today—Report of Chairman of the Council on Medical Education and Hospitals," *J. A. M. A.*, 124: 815-816, 1944.

Introductory Report*

Conference of College Chapter Officials

MINAS JOANNIDES, M.D., F.C.C.P., Chairman
Chicago, Illinois

The fundamental objective of the American College of Chest Physicians is to foster and maintain interest in the diseases of the chest organs, and give proper service to those patients who are afflicted with the diseases of the chest organs. In my opinion, this does not mean only diseases of the lungs. It includes all organs within the thoracic cavity, namely, the heart, the mediastinum, the esophagus, the thoracic blood vessels, the chest wall and the diaphragm.

It is a known fact that the close functional integration between the organs of respiration and circulation requires constant attention to the effects of diseases of the one system upon the other. We know, for example, that most fatal pneumonia cases die from a cardiocirculatory failure. We know further, that a diseased heart produces a number of changes in the lungs to warrant adequate attention to both systems. To stress the point further, we all know that diseases of the mediastinum, including tumors, may simulate diseases of the lungs and such diseases have to be definitely ruled out before proper treatment is established.

Diseases of the diaphragm, including herniae, may often simulate severe manifestations referable to the heart muscle, so that if proper diagnosis is not made, the patient may be forced to stay bedridden and be treated for coronary disease, without any treatment, until the herniae of the diaphragm are repaired.

As Fellows of the American College of Chest Physicians, it would be an injustice to the basic objectives of the College to limit ourselves to tuberculosis, because pulmonary tuberculosis is only one entity concerned with diseases of the lungs. Pneumonia, effusions in the pleural cavities, abscesses of the lungs, bronchiectasis and tumors are but a few of the problems involving the lungs, let alone the other intrathoracic organs. I believe it is high time for all of us to think in terms of all the chest organs and not to limit our interests strictly to tuberculosis and diseases of the lungs.

As we prepare for our tenth annual meeting, we find that the American College of Chest Physicians has grown from its infancy into a healthy maturity. It has a service to perform to the general public and to the Fellows of the College. It behooves the officers and the members to think in terms of greater service rendered to the patient and greater service rendered to the Fellows. Fellowship in the American College of Chest Physicians should be tantamount to a thorough understanding and ability to handle any problems concerning the organs in the chest cavity. Those of us who are somewhat rusty on the diseases of the heart and other intrathoracic organs, would do well to get added training in these entities, including a fair knowledge of electrocardiography. Those of us who are not surgically trained, should attach ourselves to someone with that type

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*Read before the Conference of Chapter Officials of the American College of Chest Physicians, Cincinnati, Ohio, November 18, 1943.

of qualification so that proper care can be rendered to the patient. Most of us have access to a fluoroscent screen, but I dare say that very few of us ever give a barium meal to rule out the possibility of esophageal pathology.

Because the chest physician cannot be expected to be a jack of all trades, better care can be rendered to the patient if Fellows of the College foster the establishment of chest service groups in their hospitals. These groups should include a roentgenologist, an internest, a cardiologist, a bronchologist and a thoracic surgeon. Such an arrangement would be an ideal set-up and can be established in the larger medical centers to the greatest advantage of the patient. In the smaller communities, it is generally necessary for the chest physician to have adequate training in all of these related subjects in order to be able to tackle the less serious of these problems and only seek more expert assistance in the more serious cases. Not all of us should be expected to be able to do a pneumonectomy but we all should be able to recognize the early manifestations of diseases of the chest organs requiring surgical interference so that the patient may have the benefits of surgery before it is too late to do any good.

We can accomplish all of these objectives by making the hospital administrators and members of the hospital staffs more chest disease conscious. In my opinion, it would be of the greatest advantage to the patient to have all patients who are admitted into a general hospital, submit to an x-ray examination of the lungs. This can be done with a slightly more reduced rate than at present cost. Furthermore, there is no reason why tuberculous patients may not be admitted into a general hospital and be treated, provided definite precautions are taken with regard to isolation. It is a known fact that about 1 to 10 per cent of the total patient population in a general hospital is found to have active pulmonary tuberculosis. What could be better than to have tuberculosis in such patients discovered as soon as they enter the hospital so that proper isolation might be established for protection of not only the other patients in the same wards, but also the hospital personnel.

The American College of Chest Physicians can render a valuable service to the community by promoting through its members a general public consciousness to the diseases of the chest organs. This can be done by having a Public Relations Committee in each chapter whose function would be to arrange for greater cooperation with the management of the hospital; to arrange for programs on the diseases of the chest organs at hospital staff meetings; to provide for speakers in the programs of state medical societies and county medical societies; and to arrange for popular lectures to lay groups and organizations emphasizing the importance of infectious diseases involving the chest organs and have a recognition of these diseases. In this case, the cooperation and integration of the activities of the Program Committee of the chapter are quite obvious.

The activities of the New Jersey Chapter are commendable. They established four standing committees, and we would recommend the adoption of similar committees by all other chapters. These committees are:

1) Membership Committee
2) Program Committee
3) Public Relations Committee
4) Nominating Committee

Our conception of the Membership Committee is that its function be not only to increase the membership of the College, but also to see that only

properly qualified and morally responsible physicians become eligible for Fellowship. In this way, a Fellowship in the American College of Chest Physicians would be tantamount to recognition by the public that the Fellow is able to handle scientifically and honestly, all problems relating to the intrathoracic organs. It should be the responsibility of chapter Membership Committees to personally contact all qualified physicians and extend proper invitations to such physicians for Fellowship in the College. It should also be the responsibility of the Membership Committee to keep out of our ranks those who are morally and scientifically unqualified. All of this can be done and should be done without lowering the prestige of the College and without placing the applicant in the embarrassing situation of being turned down if he cannot qualify.

The activities of the Public Relations Committee and the Program Committee are so inter-related that a great deal of integration is required of them. Programs of the state medical societies, the county medical societies, and hospital staff conferences can be planned by these committees. The Public Relations Committee should be the trailblazer for the arrangements and the Program Committee may step in and arrange for well constructed programs which would be an asset to the Fellows of the College, of greater value to the audience and of greater assistance to the patient. The responsibilities of these two committees are very important and upon their activities depends the influence that the College may assert upon the general public and the general medical profession.

The Nominating Committee is also important in that its responsibility lies in the proper selection of persons able enough, willing enough and interested enough, to carry on the activities of the chapter. The Illinois Chapter has tackled this problem by the stepping stone method. In order that a coordinated activity may be carried out from one year to the next, the secretary is selected and elected on his qualifications and interest in the College activities. Based on his executive ability and the degree of good work that he has done through the year, he is then promoted to the office of vice-presidency of the chapter, and in the following year he is elected to the high office of president of the chapter. In order to maintain the interest of the past presidents and in order to guide the present officers in their activities, the Illinois Chapter has established the policy of selecting the five immediate past presidents to act as an Executive Committee to work hand in hand with the chapter officers, the governors of the state and the regent of the district.

I have burdened you with a lot of words and hope that I may be forgiven for being too verbose. However, I have brought up problems which I feel that we, as executive officers of the College Chapters, owe it to ourselves, to the members who elected us and to national officers of the College, to carry out effectively and satisfactorily the objectives of the College. An organization is as strong or as weak as the activities of its local officers and members. We should, therefore, delegate ourselves to the administration of the dictates of our national officers and be the guardians of the local interests of the Fellows and also the patients who are suffering from diseases of the chest organs.

I sincerely hope that by meeting together and exchanging ideas, we can profit by each other's suggestions so that when we return home, we can act more efficiently in carrying out the policies of our national officers.

EDITORIAL

TUBERCULOSIS CONTROL IN MINNESOTA HOSPITALS FOR MENTAL ILLNESS

The mentally ill has caused a serious social and public health problem for many years. It is one that is not favorably influenced by modern medical procedure. As the need for the institutionalizing of such patients becomes more and more apparent following the effective public health measures introduced over a generation ago, two problems have developed as a result of these measures which affect our state institutions at this time.

1) Because of the effective control of contagious diseases and the modern care of infants the longevity of the population has increased to such an extent that older people suffering with degenerative diseases particularly of the nervous system have gradually entered into our state hospitals to such an extent that now approximately thirty-five per cent of the beds are occupied by these cases. While they need institutional care, it is of a different type than that provided for the treatment of the insane affecting younger age groups of the population.

2) With the control of contagious diseases as a whole which has been as successful in the institutions as in the population, there has remained one exception which now stands out in our statistics much to the disadvantage of the institution. This single infectious disease is tuberculosis. Minnesota is considering this problem as a whole but more particularly at the present time it has concentrated on the immediate elimination of tuberculosis from among its patient population. While this work began in 1934 and 1935 and has continued since, it was not until December, 1942, that a separate department in the Division of Public Institutions was created for the single purpose of getting all available data concerning cases of tuberculosis in institutions, planning for their isolation and for the application of known procedures of control. During the twelve months that Dr. H. A. Burns has been in charge of this work, 584 beds have been allocated in five institutions for the isolation of active cases of tuberculosis. All of the 15,000 inmates have been x-rayed at least once during the year and oftener if indicated. Bacteriological examination of gastric contents have been taken on all cases showing any evidence of pulmonary disease on x-ray. These have been repeated if indicated. The Minnesota State Board of Health has generously extended laboratory services to care for our additional requirements making it possible to cover the problem quite thoroughly so far as laboratory work is concerned.

During the first eleven months 12,630 x-rays have been read and 4,191 gastric lavage specimens sent in to the State Board of Health for examination on patients now in the state mental hospitals. The total positive sputum group now consists of 426 patients.

Cases showing parenchymal change are broken down into Stages I, II and III according to the national classification except frequently cases are included under I Observation which may not be due to tuberculosis. Such cases are carried until further examinations prove them to be non-tuberculous. The total case load is as follows:

Stage I	Observation	1,555
Stage II	Observation	21
Stage I	Segregation	134
Stage II	Segregation	96
Stage III	Segregation	5
Stage I	Isolation	141
Stage II	Isolation	97
Stage III	Isolation	62
Total Patients		2,111

This program which is at best only relatively complete performs in a satisfactory manner the segregation of the positive carrier and clinical case in a few beds provided for this particular purpose. It is believed that these means effectively carried out, handicapped as we are at this time, will prove satisfactory in reducing the problem of tuberculosis in this group of our institutional population. With the segregation problem effectively in operation, the difficulty in handling the inmate suffering from tuberculosis who is to be discharged or paroled because of his mental improvement or discharged through escape. Such individuals are promptly reported to the local health officer and to the State Board of Health. The danger from this group in the future will be minimized to a point that should reduce the death rate from tuberculosis in the various counties committing the mentally ill to these institutions.

J. A. Myers, M.D., F.C.C.P.

Tenth Annual Meeting
American College of Chest Physicians

Stevens Hotel, Chicago, Illinois—June 10-12, 1944

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Willard Van Hazel, M.D.
Walter H. Watterson, M.D.
Arthur S. Webb, M.D.

Housing Committee

Jacob J. Mendelsohn, M.D.
Chairman
Hugo O. Cutrera, M.D.
A. Keinigsberg, M.D.
Truman S. Potter, M.D.
Walter J. Spencer, M.D.
A. L. Szwajkart, M.D.
Vito A. D. Taglia, M.D.

Publicity Committee

Julius B. Novak, M.D.
Chairman
Harry S. Arkin, M.D.
Edwin R. Levine, M.D.
Samuel J. Pearlman, M.D.
Otto C. Schlack, M.D.

PROGRAM

Saturday, June Tenth

8:00 A. M.

Registration

9:00 A. M.

Administrative Sessions

Joint Meeting—Board of Governors and Board of Regents
J. WINTHROP PEABODY, M.D., Washington, D. C., *Presiding*

10:00 A. M.

Annual Meeting—Board of Governors
WILLIAM A. HUDSON, M.D., Detroit, Michigan,
Chairman, Board of Governors, *Presiding*

2:00 P. M.

Annual Meeting—Board of Regents
J. C. PLACAK, M.D., Cleveland, Ohio,
Chairman, Board of Regents, *Presiding*

9:00 A. M.

Scientific Session

Refresher Course in Diseases of the Chest (Sponsored by the Illinois Chapter, American College of Chest Physicians)
MINAS JOANNIDES, M.D., Chicago, Illinois, *Presiding*

The Present Status of Tuberculosis in Children
ARTHUR S. WEBB, M.D., Glen Ellyn, Illinois

Management of Minimal Tuberculosis
JULIUS B. NOVAK, M.D., Chicago, Illinois

Chemotherapy in Tuberculosis
CHARLES K. PETTER, M.D., Waukegan, Illinois

Recent Advances in Bronchoscopic Technic
PAUL H. HOLINGER, M.D., Chicago, Illinois

Indications for Collapse Therapy
RICHARD DAVISON, M.D., Chicago, Illinois

Surgical Procedures in Tuberculosis
JEROME R. HEAD, M.D., Chicago, Illinois

Surgical Procedures in Non-Tuberculous Disease
RALPH BETTMAN, M.D., Chicago, Illinois

Pregnancy in Tuberculosis
FRED M. F. MEIXNER, M.D., Peoria, Illinois

12:00 P. M.

Luncheon

*"Information Please in Medicine"**

Moderator: EDWARD P. EGLEE, M.D., New York, New York

EXPERTS

SURGERY

EVARTS A. GRAHAM, M.D., St. Louis, Missouri

ROENTGENOLOGY

EUGENE P. PENDERGRASS, M.D., Philadelphia, Pennsylvania

PATHOLOGY

ESMOND R. LONG, Col., M.C., Washington, D. C.

BRONCHOSCOPY

CHEVALIER L. JACKSON, M.D., Philadelphia, Pennsylvania

CARDIOLOGY

LOUIS N. KATZ, M.D., Chicago, Illinois

MEDICINE

(To Be Announced)

*The Program Committee will appreciate receiving questions directed to the above-mentioned experts. Members of the College are urged to send their questions at once to the Executive Offices of the College, 500 N. Dearborn St., Chicago 10, Illinois. Those questions which are accepted will be published in *Diseases of the Chest* together with the answers.

2:00 P. M.

Scientific Session

NELSON W. STROHM, M.D., Buffalo, New York, *Presiding*

Mechanical Paralysis of the Left Hemidiaphragm Complicating Collapse Therapy in Pulmonary Tuberculosis

OSCAR FEINSILVER, M.D., Worcester, Massachusetts

Pulmonary Embolism

LOUIS N. KATZ, M.D., Chicago, Illinois

Irreversible Allergy in Nontuberculous Diseases of the Chest

MILTON B. COHEN, M.D., Cleveland, Ohio

Bronchoscopy in Pulmonary Tuberculosis

RICARDO TAPIA, M.D., Mexico City, Mexico

Primary Carcinoma of the Lung

ALTON OCHSNER, M.D., New Orleans, Louisiana

Anatomy of the Bronchi and Lungs (Animated Drawings in Colored Motion Pictures)

CHEVALIER L. JACKSON, M.D., JOHN F. HUBER, M.D., and CHAS. W. NORRIS, M.D., Philadelphia, Pennsylvania

7:30 P. M.

TUBERCULOSIS IN INSTITUTIONS

Tuberculosis in Prisons
OTTO L. BETTAG, M.D., Pontiac, Michigan

Tuberculosis in Institutions for the Mentally Ill
H. A. BURNS, M.D., St. Paul, Minnesota

Tuberculosis Program of the Academy of Pediatrics and American School of Health Association
CHESTER A. STEWART, M.D., New Orleans, Louisiana

Tuberculosis in American Colleges and Universities
RUTH E. BOYNTON, M.D., Minneapolis, Minnesota

The Care of Tuberculous Veterans
ROY A. WOLFORD, Col., M.C., Washington, D. C.

Tuberculosis Control in Industry
HERMAN E. HILLEBOE, Washington, D. C.

SUNDAY, JUNE ELEVENTH

9:00 A. M.

Convocation

Signing of the College Register by Fellows

9:30 A. M.

Administrative Session

J. WINTHROP PEABODY, M.D., Washington, D. C., *Presiding*

Report of the Secretary-Treasurer:
PAUL H. HOLINGER, M.D., Chicago, Illinois

Report of the Executive Secretary:
MURRAY KORNFELD, Chicago, Illinois

Reports of Councils and Committees:
Scientific Program Committee
Membership Committee
Board of Examiners
Editorial Board, "Diseases of the Chest"
Council on Undergraduate Medical Education
Council on Postgraduate Medical Education
Council on Military Affairs and Public Health
Council on Pan American Affairs
National Council of Tuberculosis Committees

Council on Sanatorium Standards and Administration
Statistical Committee
Committee to Study the Advisability of Establishing a Board on Diseases of the Chest
Discussion of Council and Committee Reports
Nominating Committee: Election of Officers
Resolutions Committee
New Business

12:00 P. M.

Luncheon

Sponsored by Council on Military Affairs and Public Health

"Tuberculosis in World War II"

CHARLES M. HENDRICKS, M.D., El Paso, Texas, *Presiding*

United States Army
S. U. MARIETTA, Maj. Gen., M.C., Washington, D. C.

United States Navy
ROBERT E. DUNCAN, Capt., M.C., U.S.N., Washington, D. C.

Canadian Army
J. D. ADAMSON, Col., R.C.A., M.C., Winnipeg, Canada

U. S. Veterans Bureau
ROY A. WOLFORD, Col., M.C., Washington, D. C.

United States Public Health
HERMAN E. HILLEBOE, M.D., Washington, D. C.

U. N. R. R. A.
CLIFFORD WELLS, M.D., Washington, D. C.

A Radiological Specialist
JOSEPH W. POST, M.D., Philadelphia, Pennsylvania

Discussion
ESMOND R. LONG, Col., M.C., Washington, D. C.

2:30 P. M.

Scientific Session

ALVIS E. GREER, M.D., Houston, Texas, *Presiding*

Patent Ductus Arteriosus
JAMES W. NIXON, M.D., San Antonio, Texas

Primary Infection of Tuberculosis
CARLOS ARBOLEDO DIAZ, M.D., Bogota, Colombia

Diabetes and Tuberculosis
(Speaker to be announced), Rio de Janeiro, Brazil

Pitfalls in the Diagnosis of Atypical Pneumonia
WALTER L. NALLS, Maj., M.C., Washington, D. C.

Diasone in the Treatment of Tuberculosis (One Year's Experience)
KARL H. PFUETZE, M.D., Cannon Falls, Minnesota

Present Status of Chemotherapy in Tuberculosis
H. C. HINSHAW, M.D., and
WILLIAM H. FELDMAN, M.D., Rochester, Minnesota

6:30 P. M.

Social Hour

Sponsored by the Illinois Chapter, American College of Chest Physicians

7:30 P. M.

President's Dinner

RAYMOND B. ALLEN, M.D., Executive Dean, Chicago Colleges, University of Illinois, *Toastmaster*

President's Address
J. WINTHROP PEABODY, M.D., Washington, D. C.

Address of President-Elect
J. A. MYERS, M.D., Minneapolis, Minnesota

Scientific Program

Sponsored by Council on Pan American Affairs, American College of Chest Physicians
CHEVALIER L. JACKSON, M.D., Philadelphia, Pa., *Presiding*

Tuberculosis Among Sanatorium Personnel
DONATO G. ALARCON, M.D., Mexico City, Mexico

Teaching of Clinical Tuberculosis
OVIDIO GARCIA-ROSELL, M.D., Lima, Peru

Tuberculosis Program in Cuba
ANTONIO NAVARRETE, M.D., Havana, Cuba

Tuberculosis Control in the Argentine
GUMERSINDO SAYAGO, M.D., Cordova, Argentina

Tuberculosis Control in Mexico
ISMAEL COSIO VILLEGAS, M.D., Mexico City, Mexico

Tuberculosis Control in Venezuela
JOSE IGNACIO BALDO, M.D., Caracas, Venezuela

MONDAY, JUNE TWELFTH

9:00 A. M.

Scientific Session

HOWELL S. RANDOLPH, M.D., Phoenix, Arizona, *Presiding*

Artificial Pneumothorax Among Negro Patients
REUBEN HOFFMAN, M.D., Henryton, Maryland

Chronic Pleural Empyema, Its Surgical Treatment
JOHN B. GROW, Lt. Col., M.C., Denver, Colorado

Extrapleural Pneumothorax (Six Years' Experience)
DONATO G. ALARCON, M.D., Mexico City, Mexico

Evaluation of Various Operative Collapse Procedures in Pulmonary Tuberculosis
RALPH C. MATSON, M.D., WILLIAM S. CONKLIN, M.D., and SHELDON B. DOMM, M.D., Portland, Oregon

Thoracoplasty Under Spinal Anesthesia
OCTAVIO BANDALA, M.D., Mexico City, Mexico

Segments of the Lung from the Standpoint of Surgical Procedure
BRIAN B. BLADES, Maj., M.C., Washington, D. C.

Value of the Study of Bacilli in Minimal Lesions of Pulmonary Tuberculosis
H. ORREGO PUELMA, M.D., and
GUILLERMO GREBE HERNANDEZ, M.D., Santiago, Chile

12:00 P. M.

Luncheon

Annual Conference College Chapter Officials
MINAS JOANNIDES, M.D., Chicago, Illinois, *Chairman*
MERLE D. BONNER, M.D., Jamestown, N. C., *Secretary*

The Chest Specialist (His Training and Services)
MILTON SILLS LLOYD, M.D., New York, New York

Discussion

Election: Conference Officers

2:00 P. M.

Scientific Session

WILLIAM C. VOORSANGER, M.D., San Francisco, California, *Presiding*

Symposium on Tracheo-Bronchial Tuberculosis

Tuberculosis of the Trachea and Major Bronchi-Pathological Study
GERTRUDE SILVERMAN, M.D., New York, New York

Surgical Pathology of Endobronchial Tuberculosis
WILLIAM A. MEISSNER, M.D., Boston, Massachusetts

The Radiological Findings in Tracheo-Bronchial Tuberculosis
C. C. BIRKELO, M. D., and
L. A. POZNAK, M.D., Detroit, Michigan

Bronchoscopic Observations in Tuberculous Bronchitis—Clinical and Pathological Correlation
NORMAN J. WILSON, M.D., Brookline, Massachusetts

Clinical Aspects of Endobronchial Tuberculosis
MOSES J. STONE, M.D., Boston, Massachusetts

Tuberculous Bronchitis: Its Effect on the Pattern Behavior and Treatment of the Pulmonary Disease
H. MCLEOD RIGGINS, M.D., and
ROBT. P. GEARHART, M.D., New York, New York

Pulmonary Resection for Tuberculosis Complicated by Tuberculous Bronchitis: Preliminary Report
RICHARD H. OVERHOLT, M.D., and
NORMAN J. WILSON, M.D., Brookline, Massachusetts

6:00 P. M.

Dinner Meeting—Board of Regents

7:30 P. M.

Scientific Session

LOUIS MARK, M.D., Columbus, Ohio, *Presiding*

The Value of Film Files of Roentgenograms of the Chests on Miniature Film for Direct Use With Viewers as a Teaching Aid
LINNEUS G. IDSTROM, Maj., M.C., Camp Crowder, Missouri
H. L. HIEBERT, M.D., Topeka, Kansas

Automatic Control of Exposure in Photo-Fluorography (Photo-Timer)
RUSSELL H. MORGAN, M.D., Chicago, Illinois

Roentgenography of the Soft Tissues of the Thoracic Cavity and Neck
JOSE DE CARVAJAL-FORERO, New York, New York

*X-Ray Conference**

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*X-ray films of proven cases will be shown at the X-Ray Conference. Physicians desiring to present such films at the conference should send a brief resume of the case to the Program Committee, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois.

NOTE: Papers will not necessarily be presented in the order indicated, and the titles of the papers and authors are also subject to change.

EXECUTIVE COUNCIL

The Executive Council of the College will hold a dinner meeting at the Stevens Hotel, Friday night, June 9, 1944, at 6:30 P. M.

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CLINICS

Clinics will be held at the following institutions in and around Chicago, Illinois:

Municipal Tuberculosis Sanatorium, Chicago, Illinois
Cook County Tuberculosis Sanatorium, Oak Forest, Illinois
Veterans Administration Facility, Hines, Illinois
Micheal Reese Hospital, Chicago, Illinois
St. Lukes Hospital, Chicago, Illinois
Research Hospital, Chicago, Illinois

Arrangements to attend the clinics at the above mentioned institutions should be made at the Registration Desk of the American College of Chest Physicians, Stevens Hotel, Chicago, Illinois, June 10-12, 1944.

The number of physicians who can be accommodated at these clinics will be limited to available transportation facilities.

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BOARD OF EXAMINERS

The following applicants passed the written examinations held in November, 1943, and were admitted to Fellowship in the American College of Chest Physicians:

Capt. Hyman E. Bass, (MC), F.C.C.P., Santa Fe, New Mexico
Dr. Joseph E. Blum, Jr., F.C.C.P., Greenwell Springs, Louisiana
Major George S. Bowers, (MC), F.C.C.P., Denver, Colorado
Dr. Harry Brodsky, F.C.C.P., Salt Lake City, Utah
Dr. Pasquale V. Indeglia, F.C.C.P., Providence, Rhode Island
Dr. Leonard W. Moody, F.C.C.P., Bayfield, Wisconsin
Dr. Felix Ottaviano, F.C.C.P., Oneida, New York
Dr. Nile I. Reeves, F.C.C.P., Loma Linda, California
Dr. Robert B. Rodman, F.C.C.P., Wilmington, North Carolina
Major Saul Solomon, (MC), F.C.C.P., New York, New York
Dr. James F. Spigler, F.C.C.P., Terre Haute, Indiana

The Board of Examiners announces that the next written examination for Fellowship in the American College of Chest Physicians will be given at the Stevens Hotel, Chicago, Friday, June 9, 1944, at 2:00 P. M. Candidates for Fellowship in the College who desire to take the examination should communicate with the Executive Secretary of the College as early as possible.

Dr. George G. Ornstein, F.C.C.P., *Chairman*
New York, New York

COLLEGE NEWS

CHAPTER MEETINGS

North Midwest Chapter

The North Midwest Chapter of the American College of Chest Physicians was organized at Rochester, Minnesota, April 15, 1944. Dr. Jay Arthur Myers, F.C.C.P., Minneapolis, Minnesota, presided at the organization meeting and Dr. Karl H. Pfeutze, F.C.C.P., Cannon Falls, Minnesota, was appointed secretary pro-tem. The Constitution and By-Laws for College Chapters were read and adopted and upon a motion introduced by Dr. Carl O. Schaefer, F.C.C.P., Racine, Wisconsin, it was unanimously voted to fix the dues at $1.00 per year. The Nominating Committee comprised of Dr. Andrew L. Banyai, F.C.C.P., Wauwatosa, Wisconsin, *Chairman*; Dr. Edwin G. Hubin, F.C.C.P., Deerwood, Minnesota, and Dr. Sidney A. Slater, F.C.C.P., Worthington, Minnesota, presented the following nominations:

President: Dr. J. Carl Painter, F.C.C.P., Dubuque, Iowa

Vice-President: Dr. John F. Allen, F.C.C.P., Omaha, Nebraska

Secretary-Treasurer: Dr. Karl H. Pfeutze, F.C.C.P., Cannon Falls, Minnesota.

The above slate of officers were unanimously elected to serve for a term of one year. The North Midwest Chapter of the College will meet annually with recognized medical societies and will present scientific programs on diseases of the chest.

The following program was presented at the first meeting held at Rochester, Minnesota, in connection with the annual meeting of the Minnesota State Medical Association (by invitation):

The Arena, Rochester, Minnesota
Saturday—April 16th—9:00 A. M.

Dr. Earl Carpenter, F.C.C.P.
Superior, Wisconsin
Chairman

"Practical Points in the Diagnosis of Pulmonary Tuberculosis," Dr. S. A. Slater, F.C.C.P., Medical Director, Southwestern Minnesota Sanatorium, Worthington, Minnesota.

Discussant: Dr. Sumner S. Cohen, Oak Terrace, Minnesota.

"Development of Therapy in Tuberculosis During the Last Twenty-five Years," Dr. John F. Allen, F.C.C.P., Omaha, Nebraska.

Discussant: Dr. J. Carl Painter, F.C.C.P., Dubuque, Iowa.

"Present Status of Chemotherapy in Tuberculosis," Dr. H. C. Hinshaw, Mayo Clinic, Rochester, Minnesota.

Discussants: Dr. Karl H. Pfeutze, F.C.C.P., Cannon Falls, Minnesota; Dr. Carl O. Schaefer, F.C.C.P., Racine, Wisconsin; Dr. Charles K. Petter, Waukegan, Illinois.

"'All-Out' Tuberculosis Control by the Medical Profession," Dr. Karl Danielson, Meeker County, Litchfield, Minnesota.

Discussant: Dr. George D. Reay, LaCrosse, Wisconsin.

"Sarcoidosis," Dr. W. L. Meyer, Medical Director, South Dakota State Sanatorium, Sanator, South Dakota.

Discussants: Dr. George W. Beebe, Eau Claire, Wisconsin; Dr. Andrew L. Banyai, F.C.C.P., Wauwatosa, Wisconsin.

Case Reports, Dr. L. W. Moody, F.C.C.P., Medical Director, Pureair Sanatorium, Bayfield, Wisconsin.

Luncheon

Carlton Hotel, Rochester, Minnesota

Introductory Remarks, Dr. Karl H. Pfeutze, F.C.C.P., Cannon Falls, Minnesota.

Dr. Jay Arthur Myers, F.C.C.P.
Minneapolis, Minnesota
Chairman

"Transitory, Migratory Pulmonary Infiltrations Associated with Eosinophilia," Dr. J. Winthrop Peabody, F.C.C.P., President, American College of Chest Physicians, Washington, D. C.

Dr. Jay Arthur Myers, F.C.C.P., Minneapolis, Minnesota, Chairman, Program Committee.

Dr. Karl H. Pfeutze, F.C.C.P., Cannon Falls, Minnesota, Chairman, Arrangements Committee.

Governors' Committee

Dr. Gustav A. Hedberg, F.C.C.P., Nopeming
Governor for Minnesota
Chairman

Dr. John F. Allen, F.C.C.P., Omaha, Governor for Nebraska.
Dr. Karl O. Schaefer, F.C.C.P., Racine, Governor for Wisconsin.
Dr. J. Carl Painter, F.C.C.P., Dubuque, Governor for Iowa.
Dr. Andrew L. Banyai, F.C.C.P., Regent, Waumatosa, Wisconsin.

Indiana-Kentucky Meeting

The members of the Indiana Chapter of the American College of Chest Physicians were the guests of the Kentucky members of the College at a meeting held at the Elks Club, Louisville, Kentucky, April 16, 1944. Dr. Paul A. Turner, F.C.C.P., Regent of the College for District No. 8, presided at the meeting and introduced the guests and speakers. Dr. Jas. H. Stygall, F.C.C.P., Indianapolis, Indiana, Regent of the College for District No. 6, headed a delegation of College members from Indiana to the meeting. Among the officials of the College present at the meeting were Dr. Jerome V. Pace, F.C.C.P., New Albany, Indiana, Governor of the College for Indiana; Dr. Benjamin L. Brock, F.C.C.P., Waverly Hills, Kentucky, Governor of the College for Kentucky; Dr. D. W. Heusinkveld, F.C.C.P., Cincinnati, Ohio, Past President of the Ohio Chapter of the College; Dr. Jas. S. McBride, F.C.C.P., Indianapolis, Indiana, Vice-President, and Dr. H. B. Pirkle, F.C.C.P., Rockville, Indiana, Secretary-Treasurer of the Indiana Chapter of the College. The National Association was represented by Dr. J. Winthrop Peabody, F.C.C.P., Washington, D. C., President of the College, and Mr. Murray Kornfeld, Chicago, Illinois, Executive Secretary of the College.

Following a luncheon, the following scientific program was presented:

Thoracoplasty Under Local Anesthesia—Dr. R. O. Joplin, Louisville, Kentucky.

Transitory, Migratory Pulmonary Infiltrations Associated with Eosinophilia—Dr. J. Winthrop Peabody, F.C.C.P., Washington, D. C.

Vanishing Lung—Dr. D. W. Heusinkveld, F.C.C.P., Cincinnati, Ohio

Diasone—Dr. H. B. Pirkle, F.C.C.P., Rockville, Indiana.

X-Ray Conference.

Texas Chapter

The Annual Meeting of the Texas Chapter of the American College of Chest Physicians was held at the State Sanatorium, Sanatorium, Texas, April 23 and the following program was presented:

Address of Welcome, Dr. J. D. McKnight, F.C.C.P., Sanatorium, Texas.

President's Message, Dr. Alvis E. Greer, F.C.C.P., Houston, Texas.

"The Tuberculosis Control Program," Dr. Howard E. Smith, F.C.C.P., Austin, Texas.

"Recent Advances in Chest Surgery," Dr. George W. Waldron, F.C.C.P., Houston, Texas.

"Post-War Teaching of Tuberculosis," Dr. Chas. M. Hendricks, F.C.C.P., El Paso, Texas.

"Chest Pain," Dr. Henry R. Hoskins, F.C.C.P., San Antonio, Texas.

Presentation of Unusual Cases, Sanatorium Staff.

The above papers were discussed by: Dr. Chas. J. Koerth, F.C.C.P., Junction; Dr. James W. Laws, F.C.C.P., El Paso; Dr. Abbe A. Ledbetter, F.C.C.P., Houston; Dr. Robt. G. McCorkle, F.C.C.P., San Antonio, and Dr. Elliott Mendenhall, F.C.C.P., Dallas, Texas.

At the business meeting the following officers were elected to serve for one year:

President, Dr. Samuel E. Thompson, F.C.C.P., Kerrville, Texas.

First Vice-President, Dr. Robt. G. McCorkle, F.C.C.P., San Antonio, Texas.

Second Vice-President, Dr. H. Frank Carman, F.C.C.P., Dallas, Texas.

Secretary-Treasurer, Dr. Elliott Mendenhall, F.C.C.P., Dallas, Texas.

The president was authorized to appoint the following committees: Program Committee, Membership Committee and Public Relations Committee.

Dr. Alvis E. Greer, F.C.C.P., Houston, and Dr. Elliott Mendenhall, F.C.C.P., Dallas, were appointed by the Chapter to organize a subcommittee to work with the National Council on Undergraduate Medical Education to improve the teaching of tuberculosis and other chest diseases in the medical schools of Texas.

Following the meeting, Dr. J. B. McKnight, F.C.C.P., Superintendent of the Sanatorium, was host to the members and guests of the Texas Chapter of the College at a luncheon.

Forty physicians attended the meeting.

Missouri Chapter

The Missouri Chapter held a luncheon meeting at the President Hotel, Kansas City, Missouri, on April 24. Twenty-seven members and guests attended the meeting. The luncheon was followed by a two hour X-ray Conference during which films were presented by:

Dr. Samuel Snider, F.C.C.P., Kansas City, Mo.
Dr. E. E. Glenn, F.C.C.P., Springfield, Mo.
Dr. E. M. Brian, Mt. Vernon, Mo.
Dr. Paul Murphy, F.C.C.P., St. Louis, Mo.
Dr. A. J. Steiner, F.C.C.P., St. Louis, Mo.
Dr. James L. Mudd, F.C.C.P., St. Louis, Mo.

A general discussion was participated in by others in attendance.

The newly elected officers are:

President, Dr. E. E. Glenn, F.C.C.P., Springfield, Mo.
Vice-President, Dr. Melvin Tess, F.C.C.P., St. Louis, Mo.
Secretary-Treasurer, Dr. Wm. Buckingham, F.C.C.P., Kansas City, Mo.
The president appointed the following Program Committee:

Dr. H. I. Spector, F.C.C.P., St. Louis, Mo.
Dr. H. Mantz, F.C.C.P., Kansas City, Mo.
Dr. James L. Mudd, F.C.C.P., St. Louis, Mo.

It was recommended that the Program Committee make a special effort to have a place on the program of the next meeting of the State Society.

Missouri Members Participate in Meeting

The following Fellows of the College in Missouri participated in the program of the Annual Meeting of the American Association of Industrial Physicians and Surgeons, held at St. Louis, Missouri, May 9-14: Dr. Evarts A. Graham, F.C.C.P.; Dr. Andrew C. Henske, F.C.C.P., and Dr. James L. Mudd, F.C.C.P.

New Jersey Chapter Meeting

The New Jersey Chapter of the American College of Chest Physicians held their annual meeting at the Hotel Claridge, Atlantic City, New Jersey, on April 26. This meeting was held in conjunction with the annual meeting of the New Jersey State Medical Society.

Following a report on the progress of the New Jersey Chapter submitted by Dr. Irving Willner, F.C.C.P., Secretary-Treasurer, the following members were elected to hold office for the ensuing year:

President, Stephen A. Douglass, M.D., F.C.C.P., Paterson, N. J.
Vice-President, Irving Willner, M.D., F.C.C.P., Newark, N. J.
Secretary-Treasurer, Harold F. Hatch, M.D., F.C.C.P., Morristown, N. J.

A motion was unanimously adopted that the Governor of the College for the State of New Jersey be instructed to submit a proposal to the national association requiring that all applicants for membership in the College be first approved by the state chapters before being accepted as members of the American College of Chest Physicians.

Delegates to Conference

The following members of the New Jersey Chapter of the College were appointed by Dr. Clyde M. Fish, F.C.C.P., Pleasantville, New Jersey, president of the Chapter, to represent the New Jersey Chapter at the Spring Conference on Tuberculosis and Social Hygiene of the New Jersey Tuberculosis League, held at the Essex House, Newark, New Jersey, April 20:

Dr. Stephen A. Douglass, F.C.C.P., Paterson, New Jersey
Dr. Harold S. Hatch, F.C.C.P., Morristown, New Jersey
Dr. Wm. E. Wakeley, F.C.C.P., East Orange, New Jersey
Dr. Irving Willner, F.C.C.P., Newark, New Jersey.

Problems concerning tuberculosis control and other public health matters were discussed at the Conference.

The Southern Chapter Appoints Committees

Dr. Paul H. Ringer, F.C.C.P., Asheville, North Carolina, president of the Southern Chapter of the American College of Chest Physicians, announces the appointment of the following committees:

Program Committee

Dr. Paul A. Turner, F.C.C.P., Louisville, Kentucky, *Chairman*
Dr. Frank Carman, F.C.C.P., Dallas, Texas
Dr. M. D. Bonner, F.C.C.P., Jamestown, North Carolina

Membership Committee

Dr. Carl C. Aven, F.C.C.P., Atlanta, Georgia, *Chairman*
Dr. Hollis E. Johnson, F.C.C.P., Nashville, Tennessee
Dr. Kellie N. Joseph, F.C.C.P., Birmingham, Alabama

Public Relations Committee

Dr. Sydney Jacobs, F.C.C.P., New Orleans, Louisiana, *Chairman*
Dr. E. R. Fenton, F.C.C.P., Washington, D. C.
Dr. George G. Kettlekamp, F.C.C.P., Koch, Missouri

Puerto Rican Chapter

A meeting of the Puerto Rican Chapter of the American College of Chest Physicians was held on April 16 and the following program was presented:

"A Suggestion Towards the Structural Improvement of the Cardiac Coronary Circulation Without Surgical Intervention," Dr. J. A. Amadeo, F.C.C.P., Aibonito, P. R.

"Diagnostic Problems in Roentgenological Diagnosis of Anular Shadows of the Lung," Major M. Guzman, Jr., (MC), F.C.C.P., Mayaquez, P. R.

"Tuberculous Lesions in Puerto Ricans," Dr. Enrique Koppisch, San Juan, P. R.

Dr. A. M. Marchand, F.C.C.P.,
Secretary-Treasurer

Navy Promotions

Commander to Captain:

Daniel W. Wheeler, (MC), USNR, F.C.C.P., Duluth, Minnesota.

Lieutenant Commander to Commander:

Russell J. Callander, (MC), USNR, F.C.C.P., Tucson, Arizona
William B. Davidson, (MC), USNR, F.C.C.P., Worcester, Massachusetts
Benjamin E. Goodrich, (MC), USNR, F.C.C.P., Detroit, Michigan
A. Worth Hobby, Jr., (MC), USNR, F.C.C.P., Atlanta, Georgia
Ralph H. Homan, (MC), USNR, F.C.C.P., El Paso, Texas
S. Edwin Hughes, Jr., (MC), USNR, F.C.C.P., San Diego, California
Joseph J. Jacobson, (MC), USNR, F.C.C.P., Kingston, New York
Roy M. Mayne, (MC), USNR, F.C.C.P., Duluth, Minnesota
Francis P. O'Hara, (MC), USNR, F.C.C.P., San Diego, California
David Ulmar, (MC), USNR, F.C.C.P., New York, New York
Hugh G. Whitehead, (MC), USNR, F.C.C.P., Baltimore, Maryland

Lieutenant to Lieutenant Commander:

Sidney A. Britten, (MC), USNR, F.C.C.P., Syracuse, New York
Joel J. Pressman, (MC), USNR, Los Angeles, California
Elliott A. Rouff, (MC), USNR, San Jose, California
Ralph Volk, (MC), USNR, F.C.C.P., Brookline, Massachusetts

Lt. William S. Gevurtz, (MC), U. S. Navy, Commended

Lt. William S. Gevurtz, F.C.C.P., The Dalles, Oregon, was commended for outstanding professional achievement during an emergency at sea. The following "Letter of Commendation" was sent to Lt. Gevurtz by his Commanding Officer:

P15/APD-7

U. S. S. TALBOT (APD-7),
December 1, 1943

From: The Commanding Officer
To: Lieutenant William S. Gevurtz, (MC), U. S. Navy
Subject: Letter of Commendation

1. On the morning of (censored) the U. S. S. TALBOT rescued 174 survivors of the (censored) of which number 38 were casualties requiring treatment. Many of the casualties were of a serious nature, nineteen having burns varying from less than 10% to over 70% of their body surface.

2. Due to your professional skill, well-planned preparations, efficient organization, and prior instruction of medical and first aid personnel you were able to save all but one of the casualties received aboard.

3. Further, the ship was under repeated air attack throughout the period of rescue during which you and your Medical Department continued to function with no apparent concern for your personal safety.

4. Believing that this performance is exceptional considering the limited facilities and personnel available on this ship, you are hereby commended for your professional skill, coolness, and organizational ability demonstrated in this emergency.

C. C. MORGAN.

Chapter Meetings in May

The following Chapters of the American College of Chest Physicians will hold meetings with their State Medical Societies during the month of May:

May 3, 1944, Ohio Chapter, Deshler-Wallick Hotel, Columbus, Ohio.

May 7, 1944, California Chapter, Hotel Biltmore, Los Angeles, California.

May 11, 1944, New York State Chapter, Hotel Pennsylvania, New York, New York.

May 16, 1944, Illinois Chapter, Palmer House, Chicago, Illinois.

HONOR ROLL

The following is a roster listing the 365 members of the AMERICAN COLLEGE OF CHEST PHYSICIANS on active military duty.

Maurice J. Abrams
Frederick F. Ackerman
*Louis Adelman
John Sellers Agar
Arnold Albert
Hyman Alexander
Ralph M. Alley
Frank J. Altschul
Peter Amazon
Claude Anderson
Walter H. Angerman
Maxwell J. Antell
Irving L. Applebaum
Millard F. Arbuckle
Roscoe E. Avery
*George F. Aycock
Lloyd R. Ayers

Henry Bachman
Robert H. Baker
Jacob E. Banquer
Harold R. Barnes
*John D. Barnwell
Shirley Harold Baron
Jack D. Bartholomew
Hyman E. Bass
Garry G. Bassett
Ramon Julius Batory
John L. Batty
Gerald A. Beatty
Morrison Belmont
Harry Beloff
Mitchell M. Benedict
Richard C. Benkendorf
*Lester E. Beringer
Robert D. Berke
Irving Besserglick
Oscar Blitz
Allan E. Bloomberg
Milton Blum
Joseph G. Bohorfoush
Paul K. Bornstein
Hyman Borshaw
Irving P. Borsher
*Berna T. Bowers
George S. Bowers
*Aubrey L. Bradford
Frank L. Bradley
*Enoch G. Brian
Frederick D. Bridge
Sidney A. Britten
Donald W. Brodie
John J. Brosnan
David M. Brotman
Charles K. Bruhl
Kenneth N. Byrne

Russell J. Callander
Milton N. Camp
*Earl C. Carr
Gabriel Carucci
Charles A. Castle
Charles R. Castlen
Charles John Caul
John Hughes Chandler
Arthur H. Chernoff
Maurice Chernyk
Norman E. Cobb
Samuel Clive Cohen
Frank P. Coleman
Stuart R. Combs
William L. Cooke
*James P. Cooney
Franklin B. Cooper
Edward Weil Coyle
Arthur J. Cracovaner
*Paul M. Crawford
Jacob A. Crellin
Gerald L. Crenshaw

J. Emerson Dailey
Samuel D. Daniels
William B. Davidson
John D. Davis
Paul V. Davis
Loyd S. Deason
*Alfred A. de Lorimier
Gilbert den Dulk
Dominic A. De Pinto
Sidney Diamond
Edward J. Dierolf
Henry L. Dorfmann
Ralph A. Dorner
Frederick M. Doyle
Everett C. Drash
*Robert E. Duncan
John C. Dundee
Joseph E. Dushane

Friedrich Engelbach
Arthur W. Evans
George F. Evans
David W. Exley

O. Jocevious Farness
C. Basil Fausset
Abraham Feinberg
Henry Felson
Clifton Felts
Ira Fink
Elliott Fishbein
Martin M. Fisher
James F. Flattery
*James H. Forsee
*Frederick H. Foucar
*Daniel Franklin
*Arden Freer
Russell H. Frost

Leon J. Galinsky
John E. Gardner
John Robert Gateley
John Simon Gaynor
Paul W. Gebauer
Stephen M. Gelenger
Isaac I. Gellman
Joseph H. Gerber
Charles E. Gerson
William S. Gevurtz
Bernhard B. Gloeckler
Rayburne W. Goen
Alfred Goldman
John L. Gompertz
Benjamin E. Goodrich
Burgess L. Gordon
Nathan G. Gordon
Leon H. Gorfinkel
David O. Gorlin
Philip S. Gorlin
Arthur A. Gould
*Henry W. Grady
John G. Graham, Jr.
Edward A. Greco
*Mack M. Green
Norbert S. Greene
Edward W. Grove
*John B. Grow
Joseph Grund
Albert Guggenheim
Manuel Guzman, Jr.

Dominic J. Haftkowski
Snowden C. Hall, Jr.
James L. Hamilton
Ralph B. Hanahan
Roger J. Hanna
*Robert M. Hardaway
Marvin S. Harris
David A. Harrison
Harlon W. Harrison
*John C. Hart
Carl A. Hartung
Bruno S. Harwood
Thomas G. Heaton
J. Fuhrman Heinrich
Charles E. Hellweg
Olin C. Hendrix
Russell S. Henry
Vivian H. Hill
Albert W. Hobby
Arthur E. Holmes
George W. Holmes
Ralph H. Homan
Perry M. Huggin
Felix A. Hughes, Jr.
S. Edwin Hughes, Jr.
Simeon H. Hulsey

Linneus G. Idstrom
Alfred P. Ingegno
Joseph J. Jacobson
John B. Jones
Mark H. Joress

*Officers in the Regular Army and Naval Medical Services.

Albert Kaplan
Harry Leon Katz
Sidney Katz
*Paul E. Keller
Howard B. Kellogg
William M. Kennedy
Orva T. Kidder
Charles E. Kiessling
Elmer M. Kilpatrick
Jacob Kincov
Richard King
William M. Kinney
Edwin G. Kirby
Jacob J. Kirshner
Robert L. Klupt
Boldridge E. Kneece
Philip T. Knies
John Swann Knight
Louis F. Knoepp
Harold W. Kohl
Harry Konterwitz
Frederick Kosanovic
Elmer E. Kottke
Othello S. Kough
Alfred L. Kruger

Carl W. La Fratta
Swen L. Larson
*Frank Y. Leaver
Francis L. Lederer
A. A. Leonidoff
Lawrence Lercher
George L. Leslie
Oscar S. Levin
William G. Lewis
Benjamin H. Libien
Walter Lichtenberg
Paul B. Lingenfelter
Samuel Lipstein
*David E. Liston
Heinz Joseph Lorge
Robert E. Lovgren
Bernard Lowenstein
Mischa J. Lustok

Alec Cameron MacNiel
David Marcus
*Shelley U. Marietta
Jacob L. Marks
George E. Martin
*Horace P. Marvin
John A. Mathis
Roy M. Mayne
Leroy E. Mayo
Walter S. McDaniel
*Patrick I. McShane
John C. McSween
Henry E. Mehmert
Chester J. Mellies
James C. Metts
Armand M. Milanesi
Benjamin F. Miller
Louis J. Miller
Morell W. Miller
Raymond E. Miller
Samuel E. Miller
Dean H. Minnis

Bert E. Moore
James B. Moran
Dan G. Morse
Dwight J. Mosier
Alvin B. Mullen
Dan W. Myers

Walter L. Nalls
Philip H. Narodick
David A. Nathan
William Newcomer
Thomas E. Newell
Herman J. Nimitz
Thomas O. Nuzum

Francis P. O'Hara
Orland S. Olsen
Heinz Oppenheim

Luis A. Passalacqua
Gilberto S. Pesquera
Joseph C. Placak, Jr.
Joseph N. Plumer
*William C. Pollock
Jaime F. Pou
Lawrence A. Pratt
Joel J. Pressman
Henkel M. Price
John A. Proffitt
James H. Putman

*Allan B. Ramsay
Jack Reiss
Felix M. Reyes
Charles A. Ribaudo
*Edgar Ricen
Charles W. Rieber
Eric P. Robbins
*Edwin H. Roberts
John C. Robertson
Galen A. Rogers
Jacob Rogoff
Paul W. Roman
Joseph G. Rosenbaum
Louis Rosenbaum
Norman O. Rothermich
Elliot A. Rouff
Findlay D. Rutherford
Raymond C. Ryan

Paul C. Samson
Irving A. Sarot
James A. Schaal
Jacob Schloss
Richard C. Schneble
Leo V. Schneider
H. Charles Schock
Edward W. Schoenheit
Benjamin Schwartz
Emanuel Schwartz
Raymond L. Schwartz
Joel J. Schwartzman
Jesse Gordon Seastrunk
Charles A. Seelig
Morris Selman
Stanley N. Shaffer
David H. Shipp

Alexander Silverglade
Neill Simpson
John A. Sims
Jacob Smith
Leslie B. Smith
Michael Smith
Louis I. Sokol
Saul Solomon
William C. Spaulding
Phineas J. Sparer
John Wallace Stacey
Robert A. Staff
William W. Stanbro
*Earle Standlee
William B. Steen
Albert E. Steer
Israel Steinberg
Henry H. Stelman
Martin Lee Stephenson, Jr
Walter J. Stork
Cyrus W. Strickler, Jr.
Emanuel Sufrin
Lloyd K. Swasey
Herbert C. Sweet

Joseph Taymor
Harry E. Tebrock
*Carl W. Tempel
Raymond E. Tennant
Kent H. Thayer
Peter A. Theodos
David R. Thomas, Jr.
Efton J. Thomas
*William L. Thompson
Donald J. Tillou
Lawrence O. Toomey
Darrell H. Trumpe
George D. Tsoulos

David Ulmar

Deane H. Vance
Harold M. Van Der Schouw
William C. Van Deventer
Ralph Volk

*John B. Wallace
James A. Ward
Allan H. Warner
LuVerne J. Webster
Emanuel M. Weinberger
Aaron A. Weiner
Alter Weiss
Daniel W. Wheeler
William H. Wheir
Hugh G. Whitehead, Jr.
Carl J. Wilen
Herman E. Wirth
Joseph J. Witt
Sidney E. Wolpaw
David Ray Womack
Joel T. Woodburn
Fletcher J. Wright, Jr.

Stuart Yntema
*Charles T. Young
Richard W. Young

Julius Zelman